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# Early Warning Indicators of Banking Crisis in Asian Countries

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*This paper aims to test the relevance of the advanced warning indicators in the prediction of systemic banking crises in 6 Asian emerging countries over the period 1973-2012. Based on multivariate panel logit model, our empirical results suggest that among 6 determinants of banking crises ranged into macroeconomic, financial and external variables, inflation demonstrates the most significant predictive power on systemic banking crises.*

***Keywords:*** *banking crises, early warning system, panel logit regression*

***JEL classification:*** *C23, C52, G21*

## 1. Introduction

Banking crises strike relentlessly for three decades almost all countries, especially emerging Asian countries that have experienced serious problems and banking panics. The Asian crisis of 1997 can be interpreted as a currency and financial crisis that has spread in the Asian countries, after a decade of strong growth. One of the root causes of this crisis lies in an appreciation of Asian currencies (against US dollar) which caused a loss of competitiveness and a worsening trade balances in some countries such as Thailand and Malaysia. Other major causes are internal and external debts; but also a heavy reliance on foreign portfolio investment.

The Asian crisis is an overinvestment crisis in which the private sector has played a major role (overborrowing syndrom). The outbreak of the crisis in the devaluation of the Thai baht in July 1997 reveals the extent of internal financial and banking problems in Asian economies. These countries are considered as victims of private capital inflows which helped the bank credit and reduced the efficiency of the allocation of investments. Devaluation of Asian currencies begins a phase of major bankruptcies. The 1997 crisis was spread to the entire region of South East Asia, through the exchange markets and stock markets. As such, it constitutes the most marked illustration of what is known in the economic literature financial contagion.

In the current context of globalization, it is interesting to determine the basic indicators that can detect crisis signals at the earliest and to understand their dynamics. Suetorsak (2006) mentions the root causes of the Asian crisis. First, substantial amounts of foreign funds were found available at relatively low interest rates, when investors looking for new opportunities have massively shifted their capital to Asia. As with any boom phase, stock prices and real estate in Asia soared, attracting, thus, more funds. But domestic allocation of these

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borrowed foreign funds was inefficient, due to the fragility of banking systems, poor corporate governance and lack of transparency in the financial sector. The limited absorption capacity of these countries has also contributed to the inefficient allocation of foreign capital. Second, countries maintained fixed exchange rates that gave a false sense of security to borrowers, encouraging them to incur debts in US dollars. Finally, in countries affected by the crisis, exports were low in the mid of 90s for a number of reasons, including the appreciation of the US dollar against the Japanese yen, the devaluation of the yuan by China in 1994 and the loss of some markets with the entry into force of the North American Free trade.

In the literature related to Early Warning System (EWS), a lot of variables were used to explain and to predict major systemic banking crises, such as GDP growth rate, inflation and interest rates, current account balance, etc. Our contribution in this paper is to include short-term debt to external debt variable. This variable reflects the specificities of our country sample. Indeed, global financial imbalances are generally larger and more frequent in Asian emerging countries and also tend to affect the economic environment, in which these countries operate. The rest of the paper is structured as follows. Section 2 focuses on the literature review related to EAS. Section 3 presents the data and methodology. Estimation results are presented and discussed in section 4. Section 5 concludes.

## 2. Literature Review

Sufian (2009) reports that the Asian crisis of 1997 paved the way for a new century of crises for their spread and rash on emerging economies. Indeed, the Asian crisis that began in Thailand has been spread rapidly throughout the region. Haile and Poso (2008) also found that the financial panic has been spread in the region of East Asia after the collapse of the Thai Baht in 1997. This crisis was characterized by an increase in interest rates (34% in Korea, 13% in Indonesia), a dramatic fall in stock prices (-55% in Thailand, 52% in Malaysia), a depreciation in exchange rates (- 97% in Korea, Thailand -87%) and a decline in GDP across the region by 481 billion dollars. Agusman *et al.* (2008) noted that the Asian crisis tells us about a crucial element of a financial crisis that is the internal bank credit boom. The evolution of bank credit has increased massively to finance private investment. In the same context, Gugliette and Sgard (1998) found that the majority of these investments is characterized by speculative and unprofitable movements, and have destabilized Asian banks. Indeed, due the abundance of liquidity, Asian banks have massively funded the real estate sector. This outburst allocated evil of bank loans is much stronger than GDP growth. Consequently, Asian banks are confronted with a major problem that results in the inability to monitor their clients because of information asymmetry between lenders and borrowers.

Allen and Gale (2003) explain that several factors in a banking crisis are combined together to be born a true crisis. Volatility in interest and exchange rates is considered by Goldstein and Turner (1996) as the main reason for banking fragility.

Based on a panel of 26 countries, Lambretz and Ottens (2006) ranged the indicators of the recent banking crises into four categories, namely external, macroeconomic, financial and institutional indicators. The authors show that the stability of the banking sector in emerging economies is threatened by rising interest rates. Bordo (2008) also noted that the increase in interest rates for two consecutive years is a sign of a banking crisis. In the same context, Pasquariello (2008) shows that crises are based on the weakness of macroeconomic and microeconomic indicators. However, Hagen and Ho (2007), Edwards (2009) and Klomp (2010) concluded that internal, external and financial indicators are precursor determinants of recent banking crises.

The volatility of exchange rates is also among the determinants of banking crises. Indeed, Demirguc-Kunt *et al.* (2006) note that banking crises are accompanied by a depreciation of exchange rates. Moreover, they show that the exchange rate is a policy instrument and that any devaluation of the exchange rate causes difficulties borrowers' repayment. Hardy and Pazarbasioglu (1998) argue that overvalued currencies make the economy vulnerable to a currency crisis. In the same line of ideas, Gonzales *et al.* (1997) state that overvalued exchange rates stimulate imports and deteriorate the trade balance.

Detragiache (2002) highlights that in a country where the export is based on a single sector, the decline in export prices widens the deficit in the trade balance and generates a currency surplus. This risk is spread to banks by the deterioration of liabilities and, therefore, makes them unable to pay back their debts. Berg *et al.* (2008) examined the money supply indicator and state that the period in which the economy has a high growth rate of the money supply M2 is usually a crisis period. According to Lestano *et al.* (2004), M2 to foreign exchange reserves ratio is widely used in the explanation of systemic banking crises. It measures the ability of the economy to withstand speculative pressures.

Some other authors focused on the financial indicators of banking crises. Borio and Lowe (2002) indicate that banking crises result from a crucial financial indicator which is the rapid growth of bank loans.

Frankel and Rose (1996) report that expansion of bank credit leads to an increase in money supply which is an indicator of recent banking crises. Gorton (1988) adds that the rapid expansion of bank credit deteriorates the quality of banks' portfolios. Through a study of 69 countries, Beck *et al.* (2006) found that crises are less likely to emerge in economies with more concentrated banking systems. Similarly, Boyd and De Nicolo (2005), in their study based on a sample of 45 countries, notice that the bank competitiveness measured by the concentration makes banks immunized against banking crises. These results are in opposite with those of Caminal and Matutes (2002) who show that bank concentration is positively correlated with the likelihood of banking crises.

## 3. Data and Methodology

Our dataset includes 6 Asian emerging countries: South Korea, Malaysia, Indonesia, Thailand, Sri Lanka and Philippines. The aim of selecting this country sample is to construct a model that allows us to anticipate future banking crises in emerging markets. For each emerging countries, annual data over the period 1973-2012 are collected from Datastream and World Bank database. Table 1 summarizes the dates of major systemic banking crises in Asian emerging countries of our sample.

***Table 1.*** *Review of systemic banking crises in Asian emerging countries*

| Country | Dates of systemic banking crises |
|---|---|
| South Korea | [1997-2003+] |
| Malaysia | [1985-1988]- [1997-2003+] |
| Indonesia | [1994-2003+] |
| Thailand | [1983-1987], [1997-2003+] |
| Sri Lanka | [1989-1993] |
| Philippines | 1983 |

Source: Reinhart and Rogoff (2008)

To analyze the relevance of EWS's indicators in predicting systemic banking crises, we employ the panel logit regression, which is widely applied and considered to model dichotomous outcome variables. Davis and Karim (2008) highlight that logit model is the most used approach in predicting crises. The logit model estimates the probability of occurrence of banking crisis in a given country according to the following function:

$$\Pr ob(crisis_{it} = 1) = F(\beta X_{it}) = \frac{e^{\beta' X_{it}}}{1 + e^{\beta' X_{it}}} \quad (1)$$

where, $Crisis_{it}$ is the banking crisis dummy variable for country i at time t, taking the value of 1 if there is a crisis and 0 otherwise, $\beta$ is the vector of coefficients, $X_{it}$ is the vector of explanatory variables and $F(\beta X_{it})$ is the cumulative standard logistic distribution.

The log likelihood function is written as:

$$Log(L) = \sum_{i=1}^{n} \sum_{t=1}^{T} \left[ crisis_{it} \log(F(\beta' X_{it})) + (1 - crisis_{it}) \log(1 - F(\beta' X_{it})) \right] \quad (2)$$

In selecting explanatory variables, we adopt the approach of Lambregts and Ottens (2006). Therefore, we range our variables into three categories, *i.e* macroeconomic, financial and external variables. This choice is in accordance with both the theoretical and empirical literature. Table 2 presents the list of all variables.

***Table 2.*** *List of variables*

| Category | Explanatory variables | Definition |
|---|---|---|
| Macroeconomic Variables | RIR | Real interest rate (%) |
| | EGRO | GDP growth rate |
| | INF | Inflation (%) |
| | BUDG | Budget balance to GDP |

| | | |
|---|---|---|
| | HPEXCH | Real exchange rate overvaluation * |
| External Variables | CACC | Current account balance to GDP |
| | OPEN | Trade openness** |
| | USST | Short term US interest rate |
| | USLT | Long term US interest rate |
| | M2RES | M2/ Foreign exchange reserves (%) |
| Financial Variables | MGRO | Monetary growth (%) |
| | CGAP | Credit to private sector/GDP (%) |
| | DEBT | Short-term debt to external debt (%) |

* Difference between real effective exchange rate and HP detrended real effective exchange rate (Hodrick and Prescott filtering parameter: lambda=104)

**The trade-to-GDP ratio is a basic indicator of openness to trade.

The choice of the macroeconomic variables- real interest rate, GDP growth rate, inflation, current account balance and the ratio of M2 to foreign exchange reserves- is consistent with both the theoretical and empirical literature on EWS models. This is because most of banking crises resulted from fragile macroeconomic fundamentals, such as high inflation, low economic growth and high real interest rates (Blalock et *al*.(2008)). External and financial variables are selected because they reflect the specificities of our country sample. Indeed, global financial imbalances are generally larger and more frequent in emerging countries and also tend to affect the economic environment, in which these countries operate. However, a key difference of our EWS model to previous works on the subject is the inclusion of the variable short-term debt to external debt. Kalotyhou and Staikouras (2006) and Gai *et al.* (2008) noted that portfolios of emerging banks have excessive public funds intended to finance external debts of the government. As emerging economies have large external debts, the variable short-term debt to external debt may have a significant power to explain banking crisis.

The EWS model to be estimated is the following:

$$Crisis_{it} = \beta_1 RIR_{it} + \beta_2 EGRO_{it} + \beta_3 INF_{it} + \beta_4 BUDG_{it} + \beta_5 HPEXCH_{it} + \beta_6 CACC_{it} + \beta_7 OPEN_{it} + \beta_8 USST_{it} + \beta_9 USLT_{it} + \beta_{10} M2RES_{it} + \beta_{11} MGRO_{it} + \beta_{12} CGAP_{it} + \beta_{13} DEBT_{it} \quad (3)$$

To get the final model specification, we use a general to specific approach. With this method, we start by estimating the general model given by equation (3). Then, we eliminate the statistically non-significant variables at each subsequent round of regressions to obtain, in the final stage, only the significant variables.

## 4. Empirical Results

### 4.1. Descriptive Analysis

Table 3 and Table 4 show the descriptive statistics and the correlation matrix, respectively for all variables used in model (3).

***Table 3***. *Descriptive statistics*

| Variables | Observations | Mean | Std. Dev. | Min | Max | Jarque-Bera statistic |
|---|---|---|---|---|---|---|
| Crisis | 234 | 0.197 | --- | 0.000 | 1.000 | 92.803 |
| RIR | 181 | 5.245 | 4.961 | -24.600 | 21.609 | 595.576 |
| EGRO | 231 | 4.030 | 3.828 | -14.296 | 14.872 | 273.271 |
| INF | 231 | 2.032 | 0.296 | 1.991 | 2.199 | 634.165 |
| BUDG | 228 | -0.446 | 1.888 | -9.341 | 4.560 | 1066.778 |
| HPEXCH | 231 | 3.732 | 2.849 | -0.328 | 11.780 | 73.054 |
| CACC | 211 | -0.550 | 7.480 | -19.738 | 28.443 | 67.818 |
| OPEN | 231 | 118.836 | 102.898 | 38.631 | 456.087 | 134.705 |
| M2RES | 231 | 4.235 | 2.677 | 0.900 | 20.397 | 10.397 |
| USST | 231 | 6.745 | 3.052 | 1.241 | 14.804 | 19.277 |

| | | | | | | |
|---|---|---|---|---|---|---|
| USLT | 235 | 7.760 | 2.507 | 4.010 | 13.920 | 43.847 |
| CGAP | 224 | 64.050 | 43.631 | 8.821 | 210.417 | 311.253 |
| MGRO | 224 | 18.161 | 11.667 | -43.738 | 71.912 | 42.717 |
| DEBT | 196 | 18.068 | 9.319 | 3.858 | 46.389 | 54.321 |

***Table 4.*** *Correlation Matrix*

| | Crisis | RIR | EGRO | INF | BUDG | HPEXCH | CACC | OPEN | M2RES | USST | USLT | CGAP | MGRO | DEBT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Crisis** | 1.000 | | | | | | | | | | | | | |
| **RIR** | 0.061 | 1.000 | | | | | | | | | | | | |
| **EGRO** | -0.228 | 0.196 | 1.000 | | | | | | | | | | | |
| **INF** | -0.027 | -0.526 | -0.487 | 1.000 | | | | | | | | | | |
| **BUDG** | -0.019 | -0.017 | 0.017 | -0.069 | 1.000 | | | | | | | | | |
| **HPEXCH** | 0.098 | -0.146 | 0.105 | -0.013 | -0.444 | 1.000 | | | | | | | | |
| **CACC** | 0.178 | -0.034 | -0.099 | -0.375 | 0.069 | -0.046 | 1.000 | | | | | | | |
| **OPEN** | -0.050 | 0.075 | -0.006 | -0.394 | 0.058 | -0.282 | 0.776 | 1.000 | | | | | | |
| **M2RES** | 0.146 | 0.022 | 0.058 | 0.089 | 0.148 | 0.264 | -0.350 | -0.512 | 1.000 | | | | | |
| **USST** | -0.150 | -0.117 | 0.007 | 0.338 | 0.269 | -0.360 | -0.434 | -0.332 | 0.304 | 1.000 | | | | |
| **USLT** | -0.157 | 0.065 | 0.034 | 0.313 | -0.284 | -0.363 | -0.469 | -0.371 | 0.430 | 0.940 | 1.000 | | | |
| **CGAP** | 0.244 | 0.033 | 0.026 | -0.457 | 0.154 | -0.193 | 0.464 | 0.592 | -0.142 | -0.268 | -0.315 | 1.000 | | |
| **MGRO** | -0.081 | -0.103 | 0.002 | 0.375 | 0.022 | -0.090 | -0.348 | -0.297 | 0.183 | 0.248 | 0.250 | -0.191 | 1.000 | |
| **DEBT** | -0.067 | 0.012 | 0.010 | 0.020 | 0.387 | -0.324 | -0.109 | -0.053 | 0.134 | 0.252 | 0.257 | 0.323 | 0.068 | 1.000 |

As seen in Table 3, on average, 19.7% of Asian emerging countries included in our sample have experienced systemic banking crises. The analysis of correlation between variables reveals a strong dependence between the variables USST and USLT (0.940) on the one hand, and between OPEN and CACC (0.776) on the other hand. Asian countries are, usually, characterized by large proportion of exports and high degree of openness to international trade. Since current account balance include, among others, balance of trade and net income from abroad, an increase (decrease) in trade openness leads to an increase (decrease) in current account balance. This finding is in accordance with those of Romelli *et al.* (2014) who mention that more open economies experience a rise in current account.

### 4.2. Logit Estimates

The results of logit estimates are reported in Table 5.

***Table 5.*** *Estimation Results*

| **Explanatory Variables** | **Model 1** Coef. | Std. Dev. | **Model 2** Coef. | Std. Dev. | **Model 3** Coef. | Std. Dev. | **Model 4** Coef. | Std. Dev. |
|---|---|---|---|---|---|---|---|---|
| **RIR** | 0.035 | 0.068 | 0.057 | 0.067 | | | | |
| **EGRO** | ***-0.328 | 0.125 | ***-0.301 | 0.112 | **-0.319 | 0.108 | ***-0.347 | 0.110 |
| **INF** | -0.387 | 1.541 | ***-2.605 | 1.107 | *-2.387 | 0.915 | ***-2.315 | 0.885 |
| **BUDG** | 0.224 | 0.187 | 0.226 | 0.183 | | | | |
| **HPEXCH** | 0.235 | 0.211 | ***0.374 | 0.179 | ***0.302 | 0.126 | ***0.355 | 0.122 |
| **CACC** | **0.205 | 0.100 | **0.159 | 0.083 | 0.950 | 0.060 | | |
| **OPEN** | -0.028 | 0.018 | | | | | | |
| **M2RES** | ***0.556 | 0.226 | ***0.670 | 0.194 | ***0.613 | 0.161 | ***0.587 | 0.163 |
| **USST** | -0.172 | 0.181 | | | | | | |
| **CGAP** | *0.039 | 0.022 | 0.021 | 0.014 | ***0.035 | 0.013 | ***0.043 | 0.012 |
| **MGRO** | 0.007 | 0.030 | | | | | | |
| **DEBT** | **-0.154 | 0.069 | **-0.142 | 0.071 | -0.178 | 0.062 | ***-0.215 | 0.063 |
| Number of crises | 45 | | 45 | | 45 | | 45 | |
| Observations | 154 | | 179 | | 179 | | 189 | |
| Log likelihood | -46.880 | | -47.014 | | -55.001 | | -56.538 | |
| Sigma-u | 2.211 | | 2.953 | | 2.657 | | 2.574 | |
| Rho | 0.597 | | 0.726 | | 0.682 | | 0.668 | |
| Wald chi2 | 23.480 | | 23.860 | | 26.058 | | 25.630 | |
| Prob>=chibar2 | 0.000 | | 0.000 | | 0.000 | | 0.000 | |

*Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

The most relevant macroeconomic variables in predicting systemic banking crisis are EGRO, CGAP, M2RES, INF, DEBT AND HPEXCH.

The estimated coefficient of EGRO (-0.347) is statistically significant at 1% level, indicating that slow economic growth is typically a signal for the emergence of banking crises. This is consistent with most studies such as Ostu (2008), *Gai et al.* (2008) and Gersbech and Wenzelburger (2008).

The coefficient of CGAP is positive (0.043) and statistically significant at 1% level. Indeed, the Asian crisis of 1997, as Agusman *et al.* (2008) mentioned, is a typical example of financial crisis. This is due to the emergence of a domestic boom in bank credit to finance private investment with uncertain profitability. Moreover, Asian banks are fragile as they are characterized by a poorly allocated bank loans and are unable to monitor their clients because of the asymmetry of information. This shortcoming has weakened the situation of Asian banks.

M2RES is positively correlated with the emergence of banking crises. The higher this ratio, the more vulnerable the economy. For the countries of our sample, the period during which the economy records a high growth rate of the money supply in the sense of M2 is usually a time of crisis. These results are in line with those of Moshirian and Wu (2009) who consider the ratio M2RES as an indicator of the banking system's power.

With regard to variables INF and DEBT, unlike our expectations, we find that both are negatively related to crisis. The variable INF is inversely related to the emergence of a crisis phenomenon In a rapidly growing economy, such as the Asian countries, aggregate demand including raw materials, labor, fuel, energy and capital increases quickly, which leads to higher prices and therefore to inflation. Although the rapid economic growth is often attached to monetary and credit expansion which is the direct origin of inflation, it plays a significant role in reducing the emergence of crisis. On the other hand, periods of crises corroborate, usually, with large volume of debts. Countries that have experienced crises were generally highly indebted economies. For the countries of our sample, the negative coefficient shows that the variable DEBT is not a reliable indicator of banking crises. In other words, the debt is not a triggering cause of crisis in Asian countries. These results are opposed to those of Suetorsak(2006), Gai et al (2008) and Deesmosak et al (2009).

Finally, the estimates of the variable HPEXCH show a positive relationship with banking crisis indicating that the occurrence of systemic banking crisis is driven by an appreciation of the exchange rate. Indeed, Thailand, one of the emerging countries of our sample, has triggered in mid-1997 the Asian financial crisis when it became unable to defend its overvalued currency, and has interrupted anchoring it to the US dollar, making, thus the Thai Baht floating. As the crisis has been spread gradually, the political leaders of Asian countries were forced to use their foreign exchange reserves to defend their currencies.

### 4.3. Robustness Checks: Hausman Test

After the estimates of the logit model, it would be interesting to test the specification of the individual effects of Lambregts and Ottens (2006) model through the Hausman test.

Hausman test is used to differentiate between fixed effects model and random effects model. Under the null hypothesis, random effects are preferred as estimated coefficients are efficient, whereas under the alternative hypothesis, fixed effects estimators are consistent, and then, preferred.

The statistic of the test is given by:

$$H = (\hat{b}_{MCG} - \hat{\beta}_{Within})'\left[Var(b_{MCG}) - Var(\beta_{Within})\right]^{-1}(\hat{b}_{MCG} - \hat{\beta}_{Within}) \qquad (4)$$

Where: $\hat{b}_{MCG}$ - MCG estimator, $\hat{\beta}_{Within}$ - Within estimator,

The results of Hausman test are reported in Table 6.

***Table 6.*** *Hausman test results*

| Variables | Coefficients | | | |
|---|---|---|---|---|
| | (b) | (B) | (b-B) | sqrt (diag(V_b –V_B)) |
| | fixed | fixed | Difference | |
| **EGRO** | -0.3046090 | -3.4776420 | 0.0431552 | 0.0562092 |
| **INF** | 12.3054200 | -2.3159660 | 14.6213800 | 16.8627300 |
| **HPEXCH** | 0.2737286 | 0.3554971 | -0.8176850 | 0.0459522 |
| **M2RES** | 0.6220054 | 0.5875762 | -0.0344291 | 0.0478750 |
| **CGAP** | 0.0427216 | 0.0431070 | -0.0003854 | 0.0098457 |

| | | | | |
|---|---|---|---|---|
| **DEBT** | -0.2071239 | -2.1507960 | 0.0079557 | 0.0364873 |

b = consistent under Ho and Ha; obtained from xtlogit
B = inconsistent under Ha, efficient under Ho; obtained from xtlogit
Test: Ho: difference in coefficients not systematic
chi2(6) = (b-B)'[(V_b – V_B) ^(-1)](b-B) = 8.57
Prob>chi2 =0.1993

Table 6 shows that prob = 0.1993>0.05. Therefore, the null hypothesis is approved, indicating that random effects model is preferred than fixed effects model.

## 5. Conclusion

The Asian crisis of 1997 was seen as one of the most terrific dangers to Asian emerging countries. This crisis was driven, among others, by the massive indebtedness of some countries that have over-invested in the 90s in unprofitable or very risky projects, particularly in the real estate sector. An important part of the private sector debt was contracted in foreign currencies (mainly in US dollars) without hedging. As currency risk was significant, a depreciation of the domestic currency against the US dollar increases mechanically the amount of debts. Therefore, these market imperfections weakened Asian banks which suffered deterioration in their balance sheets due to losses and the increase in impaired loans. This situation ended up with devaluation of local currencies which lead to the emergence of the crisis.

Faced with the recurrence of banking crises in recent decades, several regulatory authorities have developed some models in the line of early warning systems (EWS) in order to predict crises. These models of crises prediction enable decision-makers to identify economic weaknesses and vulnerabilities in order to take preventive measures to reduce the risk of appearance of a crisis. The aim of our paper was to determine the variables that may have a role in predicting banking crisis in 6 Asian emerging countries over the period 1973-2012. Macroeconomic, external and financial indicators of banking crisis were selected. Based on panel logit model, our results reveal that inflation has the strongest impact in predicting systemic banking crisis, while economic growth, real exchange rate, the ratios M2 by foreign exchange reserves, credit to private sector by GDP and short-term debt to external debt have a small effect. In order to enlarge the explanatory variables that may be associated with systemic banking sector problems, it would be interesting in further research to include other variables, such as financial liberalization, in explaining systemic banking crisis.

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