Early Warning Systems for Banking Crises: Political and Economic Stability

(Sistem Amaran Awal untuk Krisis Perbankan:Kestabilan Politik dan Ekonomi)

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ABSTRACT

Early Warning System (EWS) is a system that tries to predict the probability of crises using environmental factors. This study seeks to develop an EWS for the probability of systemic banking crises in East Asian countries by using a logit model taking into account a wide range of political and economic factors. Results reveal that short-term debt and exchange rate depreciation may trigger speculative attacks during political instability, economic slowdown, and inefficient regulatory environments. Policymakers and regulators may be able to prevent crises by stabilizing political and economic conditions. Furthermore, results indicate that government instability, corruption, high short-term debt, unstable monetary and fiscal policies do not only reduce investors' confidence but also prevent effective crisis prevention strategies. Therefore, by adopting the EWS the government would be able to monitor environmental changes causing crises.

Keywords: Early Warning System (EWS); political stability; systemic banking crises; East Asia

ABSTRAK

Sistem Amaran Awal (EWS) adalah sistem untuk meramalkan kebarangkalian berlakunya krisis ekonomi dengan mengambil kira perubahan faktor persekitaran. Kajian ini bertujuan membangunkan EWS dalam meramal kebarangkalian berlakunya krisis perbankan sistemik di negara-negara Asia Timur melalui model logit dengan mengambilkira pelbagai faktor politik dan ekonomi. Keputusan kajian menunjukkan bahawa hutang jangka pendek dan susut nilai kadar pertukaran boleh mencetuskan serangan spekulasi dalam keadaan ketidakstabilan politik, kelembapan ekonomi, dan persekitaran kawal selia yang tidak cekap. Penggubal dasar dan pembuat undang-undang mungkin dapat mencegah krisis dengan menstabilkan keadaan politik dan ekonomi. Tambahan pula, keputusan menunjukkan bahawa ketidakstabilan kerajaan, amalan rasuah, hutang jangka pendek yang tinggi serta dasar fiskal dan kewangan yang tidak stabil bukan sahaja mengurangkan keyakinan pelabur, tetapi juga menghalang pelaksanaan strategi pencegahan krisis yang berkesan. Oleh itu, dengan menggunapakai EWS pihak kerajaan dapat memantau perubahan persekitaran yang menyebabkan krisis ekonomi.

Kata kunci: Sistem Amaran Awal (EWS); kestabilan politik; krisis perbankan sistemik; Asia Timur

INTRODUCTION

Banking crises have unexpectedly influenced advanced and emerging countries around the world over the past decade. For illustration, the Asian crises of 1997-98 were an international shock to economists and policy community because East Asian countries were growing fast (Radelet, Sachs, Cooper & Bosworth 1998). After a decade, the world experienced the effect of 2007 U.S. crisis, which later hit advanced economies. Previous research associated the crises with slow responses from policy makers, structural and financial problems, regulations, economic and political conditions (Kaminsky & Reinhart 1999; Radelet et al. 1998; Reinhart & Rogoff 2009). Hence, these crises may be avoided if associated problems could be overcome.

The recurrence of crises has motivated policy makers and academies to study the underlying causes of crises. The question regarding the practical policies that authorities could have adopted to prevent the Asian and U.S. crises has drawn the attention of researchers to develop an Early Warning System (EWS). EWS tries to predict the probability of crises using environmental factors, such as economic conditions. Studies on EWS (Barrell, Davis, Karim & Liadze 2010; Demirguc-Kunt & Detragiache 2005; Kaminsky & Reinhart 1999) have associated crises with economic factors, such as balance of payment deficits, business cycles, short-term debt, interest rates, and credit growth. Although these factors are signal of crises, there could be other factors such as factors related to speculative attacks which can explain the recurring crises better. Hence, a deeper

understanding of factors explaining speculative attacks, such as exchange rate depreciation and short-term debt would help us to better understand the dynamic nature of the recurring crises. Unlike existing studies, the present study develops a EWS which takes into account those factors as well as political conditions besides economic conditions.

Speculative attacks are important factors in spreading a crisis, which have originated in investors' fears (Krugman 1979; Radelet et al. 1998). Foreign reserves depletion and exchange rate depreciation in a pegged exchange rate can explain the relationship between speculative attacks and crises in which a substantial depletion of foreign reserves would cause currency depreciation and speculative attacks (Krugman 1979).Furthermore, increasing short-term debt coupled with inadequate regulatory and supervisory environment would expose countries to rapid capital outflows and investors' fears (Radelet et al. 1998). The impact of those factors can be exacerbated when political conditions are included in the analysis. When policymakers experience speculative attacks on their currency and capital, their adopted policies may be inadequate. Taking the example of speculative pressure on currency in a pegged exchange rate regime, policymakers usually try to defend their currency by depleting foreign reserves which causes even higher speculative pressures (Walter & Willett 2012).

In explaining the relationship between short-term debt and speculative attacks, Radelet et al. (1998) proposed a rational panics theory in which high debt payments produce signals to the international investors to withdraw their deposits and funds from banks and projects which cause speculative attacks. Those examples show that how speculative attacks are associated with currency depreciation (Krugman 1979) and short-term debt. Furthermore, human behaviors such as corruption, government instability, regulatory environment and financial payment obligation have significant roles in explaining the dynamic nature of crises, such as during 1997-98 East Asian financial crises where investors and speculators reacted to short-term debts by withdrawing credit from the East Asian countries. For example, Singapore which has the highest political stability index (23.03) compared to other East Asian countries as shown in Table 2 is least affected by the Asian financial crisis. Hence, the prediction of speculative attacks through EWS which can also capture political and economic conditions may help us to predict future crises better. It is crucial to consider all factors including the complexity of human behaviors which potentially trigger systemic crises. Nevertheless, it is impossible to employ a large number of factors in an empirical study. Therefore, the present study will adopt three indices i.e. political stability, economic performance and debt status considering a wide range of environmental factors including short-term debt,

exchange rate depreciation, political and economic conditions in developing EWS for systemic banking crises which can further capture disparate sources of speculative attacks.

Given some similarities between crises (Reinhart & Rogoff 2009), such as the importance of investors' confidence, the developed EWS using 1997-98 Asian crises can further predict future crises. Accordingly, the purpose of this study is to develop a straightforward and comprehensive EWS by employing three indices of economic performance, political stability, and debt status as well as exchange rate depreciation for 10 East Asian countries over the period of 1995-2010.

The remainder sections of this study are organized as follows. Section 2 devoted to the literature review related to the EWS and surveys the methodologies, indicators, and results of previous studies. Section 3 presents the methodology related to logit model. The discussion of the sample data and empirical specification of the EWS are expressed in Section 4. Reports of the results and predictors of systemic banking crises are provided in Section 5. While the final remaining section presents the conclusions of this study.

LITERATURE REVIEW

EWS analysis consists of four steps; namely crisis detection, approaches, variable selection, and diagnostic tests. This analysis enables us to identify the potential predictors of banking crises and warn the probability of future crises. With regard to the first step of EWS, the previous studies indicate that the high banking sector nonperforming loans, emergency measures, large scale bailout costs, mergers, takeovers, and closures mark the onset of a systemic banking crisis (Barrell, Davis, Karim, Liadze 2010; Barrell et al. 2011; Caprio & Klingebiel 2003; Cashin & Duttagupta 2008; Demirgüç-Kunt & Detragiache 1998; Demirguc-Kunt & Detragiache 2005; Kaminsky & Reinhart 1999). The detection of crises enables researchers to proceed to the next step of adopting an appropriate approach.

There are different approaches to develop an EWS; namely signal approach, Binary Classification Tree (BCT) and logit model. The first two approaches conduct a non-parametric analysis on the behavior of each country-specific factor during tranquility and crises. Signal approach sets a threshold level for each predictor of crises and compares the value of each predictor with its threshold level. If the value of a predictor exceeds its threshold level, it signals the onset of a crisis in 12 to24 months (Kaminsky & Reinhart 1999). Signal approach suffers from the problem of contradictory signals from different predictors. On the other hand, BCT is a decision tree tool, which issues various sets of rules from variables (Cashin & Duttagupta 2008). Although BCT has overcome the problem of contradictory signals by considering

various predictors in issuing a rule, it can hardly take into account the interactions among predictors (Cashin & Duttagupta 2008).

In order to solve the aforementioned problems, parametric approach of logit model uses a set of variables to develop a model and estimate the probability of crises. Hence, it avoids the problems of possible contradictory signals and disregarded interactions among variables (Demirgüç-Kunt & Detragiache 1998; Eichengreen, Rose & Wyplosz 1996; Frankel & Rose 1996). Given the discussed background, the current study adopts logit approach to estimate the probability of banking crises, which can employ economic and political variables in predicting the probability of crises.

In developing the EWS, researchers have encountered variable selection problems because there are disparate reasons for banking crises, such as speculative attacks, economic conditions, and political instabilities. There is a consensus among researchers on the contribution of economic and political variables to EWS. However, the problem is the anomalous behaviors of countries, which make it difficult to generate a unique EWS. With regard to the former, an overview of empirical studies (Barrell et al. 2010; Caprio & Klingebiel 2003; Cashin & Duttagupta 2008; Davis & Karim 2008; Demirgüç-Kunt & Detragiache 1998; Demirguc-Kunt & Detragiache 2005; Eichengreen, Rose & Wyplosz 1994; Eichengreen et al. 1996; Frankel & Rose 1996; Kaminsky & Reinhart 1999; Männasoo & Mayes 2009) show that they have used different macroeconomic variables. Indeed, the economic variables associate crises with the conditions of financial sectors, external sectors, and real sectors. With regard to the latter, a few studies (Biglaiser, Derouen & Archer 2011; Leblang & Satyanath 2006; Leblang & Satyanath 2008;)*,* have empirically investigated the predictive power of political conditions for crises. However, the results show little influence in predicting the probability of crises (Biglaiser et al. 2011). The existing empirical studies can hardly report significant influence for economic instability, political conditions, and regulatory environments because of small changes in their figures. Therefore, the present study will improve the predictive power of EWS by considering disparate aspects of political instability, regulatory environment, economic instability, and short-term debt using indices which even capture small changes in figures.

After developing the EWS for systemic crises, researchers assess the developed model using diagnostic tests. Taking the example of logit approach, they evaluate the predictive power of the estimated model by predicting the probability of crises in a sample of test data. They later compare the estimated probabilities with the actual crisis to validate whether predictions match the reality. Following this discussion, this study employs three indices for political, economic, and debt conditions as well as a variable for exchange rate depreciation to

consider different underlying causes of banking crises in developing EWS.

In summary, this study contributes to the field of EWS by using an array of political and economic variables as well as debt status. The variables improve the existing EWS by considering political and economic instabilities. Regulatory environment, financial payments, government stability and turnover, corruption perception, and capital policies are some political issues which can be the harbinger of an unstable country. In order to examine the impact of those factors on banking crises, the current study uses an index of political stability. In addition, the current study improves the existing methodology by using the indices of economic performance and debt status which take account of the vulnerability of financial sectors to shocks. The following section focuses on the methodology to develop the EWS in predicting systemic banking crises using East Asian data.

METHODOLOGY

The present study adopts a logit model to estimate the probability of systemic banking crises and to employ different economic and political variables in developing an EWS. Logit model is a parametric approach and demonstrate the contribution of each factor to crises. It adopts a logistic Cumulative Distribution Function (CDF) to associate a dependent variable with a set of explanatory variables as in Equation 1 (Demirgüç-Kunt & Detragiache 1998; Demirguc-Kunt & Detragiache 2005; Kaminsky & Reinhart 1999; Laeven & Valencia 2010).

$$P_{Crisis} = \text{Prob}(Y = 1|x) = \frac{e^{x'\beta}}{1+e^{x'\beta}} = \Lambda(x'\beta) \qquad (1)$$

$\Lambda(\cdot)$ represents a logistic CDF, which offers a nonlinear function for Y as the dependent dummy variable with $Y = 1$ (crisis period if at least three out the following six criteria are fulfilled) (Laeven and Valencia, 2010; 2013). The six conditions are large scale nationalization, public bailout of more than 3 per cent of GDP, large scale asset purchases by central banks of more than 5 per cent of GDP, liquidity funding from central banks more than 5 per cent of total banking liabilities, deposit freezes, and large scale guarantees on bank liabilities.[1] While Y only takes 0 for a non-crisis period and 1 for a crisis period, the estimated probability ($\hat{P}_{Crisis}$) ranges between 0 and 1 which can further report increasing probability of crises during tranquility and declining probability during crises. x', (x$_{1,it}$, x$_{2,it}$, ..., x$_{K,it}$), is a vector of potential explanatory variables for banking crises including exchange rate depreciation and three indices for political stability, economic performance and debt status. Additionally, in Model 3, other variables; namely real GDP growth, inflation rate, interest rate, broad money to total reserve ratio, and domestic credit to GDP ratio that may represent

TABLE 1. Definition of variables

Independent variables	Definition	Mnemonic
Focal variables:		
Exchange rate depreciation	Change in log of Exchange rate	ΔLn EXH
Political Stability	Political stability index comprising regulatory and political variables ranging from 0 to 25, with 25 representing the best political conditions.	PoliticalS
Economic Status	Economic performance index comprising macroeconomic conditions and financial structure ranging from 0 to 25, with 25 representing the best economic conditions	ΔEconomicP
Country Risk	Country risk is measured by debt status index that ranges from 0 to 10, with 10 exhibiting the best status.	DebtS
Variables for Robustness Test:		
Economic growth	GDP growth rate	ΔGDP
Inflation	Annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly	Inflation rate
Money supply	Measure of money multiplier by which reserve money creates money supply in the economy. M3 aggregate (or broad money) includes currency with the public and deposits.	Broad money/total reserves
Domestic credit to GDP	Changes in financial resources provided by the Central Bank for lending in a country that establish a claim for repayment, in terms of GDP.	ΔDomestic credit/GDP
Interest rate	The lending interest rate adjusted for inflation.	ΔRealint
Current account balance growth	Current account balance growth	ΔCA

economic performance (other than Economic status) are tested to examine whether the specified model can completely capture all environmental conditions. In Model 4, we further test current account balance growth (ΔCA) which may represent debt status of a country (other than Debt S) to investigate whether the model can completely capture debt status condition. The estimation of Equation 1 requires linearizing the relationship (Λ) and coefficients (β) as in Equation 2:

$$Ln\left(\frac{P_{Crisis}}{1 - P_{Crisis}}\right) = x'\beta + \varepsilon \qquad (2)$$

The maximum likelihood (ML) approach is adopted to estimate the coefficients of Equation 2 and to predict the probability of systemic banking crises. The fact that estimated probabilities deviate from their values of 0 and 1 is a reason for including a stochastic error term (ε). In order to estimate the coefficients of Equation 2, the sample period of 1995-2010 is divided into two periods of in-sample (1995-2006) and out-of-sample (2007-2010). The in-sample period estimates EWS, whereas the out-of sample period uses the estimated model to examine the predictive power of the estimated EWS in predicting new crises and non-crises periods. Although the sign of coefficients implies the direction of the influence of a factor (x_k) on crises, it can indirectly show the effect of one unit change in x_k on P_{crisis}. Particularly, an estimated coefficient of such a model indicates the impact of one unit change in an explanatory variable

(Demirgüç-Kunt & Detragiache 1998; Gujarati & Porter 2009; Greene 2008).

THE DATA AND THE EMPIRICAL SPECIFICATIONS

The current study uses a sample of 10 East Asian countries (Cambodia, China, Indonesia, Malaysia, South Korea, Thailand, the Philippines, Singapore, Hong Kong and Vietnam) to estimate an EWS for systemic banking crises. The sample ranges the period of 1995-2010 with a total of 160 annual observations including crises periods and explanatory variables. The systemic banking crises are obtained from Demirguc-Kunt and Detragiache (2005) and Laeven and Valencia (2010) which represent seven episodes with the total length of 21 years.[2] Additionally, explanatory variables are provided by two databases of the World Bank's World Development Indicators (WDI) and EUROMONEY.

Collected data is used to estimate the EWS as in Equation 3:

$$Ln\left[\frac{\hat{P}_{Crisis}}{1 - \hat{P}_{Crisis}}\right] = \hat{C} + \hat{\beta}_1 \Delta lnEXH_t + \hat{\beta}_2 PoliticalS_{t-1} +$$
$$\hat{\beta}_3 \Delta EconomicP_{t-1} + \hat{\beta}_4 DebtS_{t-1} \qquad (3)$$

where, $\hat{P}_{Crisis}$ denotes the estimated probability of crisis. C is constant, and (−1) refers to the lagged value of 4

explanatory variables (e.g. Equation 3 regresses the value of dependent variable in 2010 on the values of explanatory variables in 2009) where $\hat{\beta}_i$, $i = 1, \ldots,$ 4 are the unknown coefficients of those explanatory variables including exchange rate depreciation (ΔLnEXH), political stability index (Political S), economic performance index (Economic P), and debt status index (Debt S).

Table 2 presents economic performance and political stability of sample countries using the average values of two indices ranging between 0 and 25, with 25 representing the highest stability and performance. Economic performance index which considers bank and monetary stability, budget deficit or surplus, unemployment and economic growth captures economic and financial instability. Additionally, political stability index considers regulatory conditions, non-corruption perception, government stability, financial payments (e.g. as loans and dividends), and non-capital repatriation[3]. Finally, Debt status index considers debt stocks to GNP ratio, current account balance to GNP ratio, and debt service to exports ratio. This index spans from 0 to 10, with 10 representing the best status and shows instability in external sectors as well as debt payments hence, potential for speculative attacks.

The figures in Table 2 indicate that Singapore, Hong Kong, and South Korea respectively have provided the best economic environments which are 18.68, 17.20, and 14.09, as well as the best political environments that respectively are 23.03, 19.90, and 18.53;hence, politically more stable. Hong Kong and South Korea have the lowest debt with an index value of 10 for Hong Kong and 9.75 for South Korea. While Cambodia has the worst economic and political environment that respectively is 4.45 and 6.05. Indonesia has the highest debt with an

index of 8.05. To sum, a politically stable country with high economic performance as well as low debt has low probability of crises.

Regarding to the EWS specification as in Equation 3,the present study expects negative coefficients for previously discussed indices. As for the exchange rate depreciation, we expect a positive relationship with banking crises (Barrell et al. 2010; Biglaiser et al. 2011; Caprio & Klingebiel 2003; Cashin & Duttagupta 2008; Davis & Karim 2008; Demirgüç-Kunt & Detragiache 1998; Demirguc-Kunt & Detragiache 2005; Eichengreen et al. 1994; Eichengreen et al. 1996; Frankel & Rose 1996; Kaminsky & Reinhart 1999; Männasoo & Mayes 2009).

RESULTS

Reports of the estimates and predictive power of logit models for four EWS are presented in Table 3. Model 1 shows the estimated coefficient of exchange rate depreciation, political stability index, economic performance index, and debt status index, which is used to predict the probability of systemic banking crises. Additionally, Models 2, 3, and 4 evaluate Model 1 for robustness to ensure that estimates and predictive power are robust to variables selection. We even remove political stability index to examine the contribution of political conditions to the predictive power of EWS.

Model 2 shows that other variables; namely exchange rate depreciation, economic performance index, and debt status index are still significant with expected signs. On the contrary, the in-sample predictive power of non-crises periods declines to 96.05 per cent. This implies that Model 1 outperforms Model 2 regarding the

TABLE 2. Political stability, economic performance and debt status by country, 1995-2010

	Political stability[a]	Economic performance[b]	Debt status[c]
Cambodia	6.05	4.45	8.60
China	16.72	11.96	9.11
Hong Kong	19.90	17.20	10.00
Indonesia	10.91	8.87	8.05
South Korea	18.53	14.09	9.75
Malaysia	17.36	12.29	8.25
The Philippines	13.06	9.36	8.35
Singapore	23.03	18.68	10.00
Thailand	15.75	10.89	8.55
Vietnam	11.30	8.13	8.52

[a] Political stability and economic performance are two indices for the political and economic conditions of the sample. The political stability is comprised of regulatory and political variables ranging from 0 to 25, with 25 representing the best political conditions.
[b] The economic performance is comprised of variables for macroeconomic conditions and financial structure ranging from 0 to 25, with 25 representing the best economic conditions.
[c] Debt status is an index and ranges from 0 to 10, with 10 exhibiting the best status.
Source: EUROMONEY (1995-2010)

TABLE 3. The early warning systems for systemic banking crises during the in-sample period of 1995-2006

	Model 1	Model 2	Model 3	Model 4
ΔLnEXH	32.400***	29.455***	44.674***	28.315***
PoliticalS	-0.217*			
ΔEconomicP	-0.662***	-0.623***	-0.490*	-0.627***
DebtS	-0.493***	-0.564***	-0.487*	-0.510**
ΔGDP			-0.197	
Inflation rate			0.245	
Broad money/total reserves			0.220	
ΔDomestic credit/GDP			0.008	
ΔReal int			0.085	
ΔCA				-0.214
Constant	3.953*	1.421	-1.608	1.006
In-sample: % crisis Prediction	80	80	75	80
In-sample: % no crisis Prediction	97.37	96.05	100	95.83

Note: The political stability, economic performance, and debt status are indices for political, economic (excluding debt), and debt variables, respectively.
Threshold level for prediction = 50%
*, **, *** Significant at the 10%, 5% and 1% level

predictive power because it includes political conditions. This results is consistent with Leblang and Satyanath (2008) that shows political variable improves the crises forecasts as well as able to accurately predict the crises. Model 3 includes GDP growth, inflation rate, broad money to total reserves ratio, domestic credit to GDP ratio, and real interest rate. But they are insignificant implying economic performance index completely captures economic information. The in-sample predictive power of EWS for crises periods erodes from 80 per cent in Model 1 to 75 per cent in Model 3, which implies that Model 1 outperforms Model 3 regarding the predictive power. Although Model 3 predicts 100 per cent of non-crises periods, it uses more economic variables which are insignificant. This indicates that the EWS with more variables may represent better predictive power, but this model is not preferable because it may have low predictive power for future crises.

Finally, Model 4 demonstrates insignificant coefficient for current account balance growth in the presence of debt status index, which implies that Model 1 with only debt status index can still capture debt-related information. The in-sample predictive power of Model 4 for non-crises periods erodes from 97.37 per cent in Model 1 to 95.83 per cent, which implies that Model 1 outperforms Model 4 regarding the predictive power. Given previously discussed findings, Model 1 outperforms other models in predicting crises and non-crises periods by considering environmental factors better. Therefore, the following discussion is focused on Model 1 using the in-sample period of 1995-2006, which

predicts 80 per cent of crises periods and 97.37 per cent of non-crises periods.

Results in Model 1 of Table 3 show that 1 unit change in political stabilities, economic performance and debt status, the log odds of non-crisis period decreases by 0.217, 0.662 and 0.493 respectively. The negative sign of the coefficients for political stabilities, economic performance and debt status indicate that the better condition of the countries' political stabilities, economic performance and debt status, the less likely the countries to be in the crisis period. In other words, the results imply that countries with better political stabilities, economic performance and debt status are more likely to be in non-crisis period. Not only those conditions, the positive significant sign of exchange rate depreciation (32.4) indicates that domestic currency deterioration during crises affects foreign reserves depletion which causes capital flights and exacerbates crises (Davis et al. 2011; Eichengreen et al. 1994; Kaminsky & Reinhart 1999; Männasoo & Mayes 2009) .

Regarding the environmental conditions, the significant negative coefficient of political stability index (-0.217)indicates that corruption, government instability, financial payment and regulatory problems are associated with higher probability of crises, which is consistent with the discussions of (Demirguc-Kunt & Detragiache 2005; Eichengreen et al. 1996; Kaminsky & Reinhart 1999; Noy 2004) . Additionally, the negative coefficient of economic performance (-0.662) indicates that problems in financial and real sectors, banking industries, monetary and currency policies expose banks to crises, which is similar

to the findings of (Barrell et al. 2011; Demirguc-Kunt & Detragiache 2005; Eichengreen et al. 1996; Kaminsky & Reinhart 1999). Finally, the negative relationship between high debt and crises (-0.493)indicates that the lower the debt status index, the higher is the debt of a country which increases the probability of crises. The lower the debt status index draws attention to the role of investors in increasing probability of crises. The increased in short-term debt is a signal of upcoming crises, which may cause deposit withdrawal and speculative attacks by investors (Ivashina & Scharfstein 2010; Radelet et al. 1998).

For robustness check, we insert the coefficients of Model 1 into Equation 3 that results in Equation 4.The specified EWS of Equation 4 using the in-sample data of 1995-2006 able to predict 83 per cent of crises and non-crises periods of out-of-sample data. We can conclude that better economic and political environments as well as lower debt reduce the probability of banking crises. In addition, exchange rate depreciation during crises has significant influence on triggering speculative attacks, hence worsen the crises.

CONCLUSION

This study develops an EWS for systemic banking crises using economic and political conditions as well as speculative attacks to consider human behaviors. This study estimates the probability of banking crises in 10 East Asian countries using logit models during the period of 1995-2010. Our results illustrate that economic and political conditions may lead to a systemic banking crisis. For economic conditions, current account deficits, economic slowdowns, financial sector problems, monetary and currency instability, as well as inefficient regulations increase speculative attack which finally increase the probability of a crisis. Furthermore, this paper found that debt status, and exchange rate depreciation are signals for investors to withdraw their money from banks and projects, which lead to speculative attacks and in turn increase the probability of crises. Additionally, political factors, such as government instability, corruption, regulatory environment, and financial payment obligations delay authorities' reaction towards responding to crises. In short, lagged reactions by the authorities reduce the effectiveness of policies implemented. In summary, the present study reveals that speculative attacks (weak economic condition, debt status, exchange rate) and human behaviors (weak political condition) are critical factors in estimating probability of crisis.

From practitioner's perspective, debt status and exchange rate depreciation are warnings to investors of upcoming crises, which cause speculative attacks. Additionally, poor economic condition increases the probability of systemic banking crises such as in the East Asian countries. Not only that, economic and political instabilities may delay the process of adopting crises prevention policies and exacerbate speculative attacks. The findings from this study may help policymakers and managers in detecting the increased probabilities of crises. The predicted probabilities help them to adopt pre-emptive strategies to avoid or reduce the repercussions of systemic crises.

The findings suggest that managers and policymakers should monitor political and economic conditions as well as debt status constantly because they are important determinants for EWS. Balance of payment deficits, debt, and exchange rate depreciation may lead to a crisis if investors and speculators respond negatively to short-term debt and sudden exchange rate depreciation. For future research, we would suggest for other factors related to human behavior being taken into account to improve the effectiveness of EWS in predicting future crises.

ENDNOTES

1   In addition to those criteria, there are two more conditions that can solely indicate the onset of a crisis; namely non-performing loans of more than 20 per cent of total banking system assets and public bailout of more than 5 per cent of GDP.
2   Seven episodes refer to China (1998), Indonesia (1997-2001), Malaysia (1997-99), South Korea (1997-98), Thailand (1997-2000), the Philippines (1997-2001) and Vietnam (1997).
3   Capital repatriation is capital transfer from abroad to a home country, and some foreign governments impose restriction on capital transfer. Either huge capital outflow or capital transfer restriction can be a signal of upcoming crises.

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