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**Philippine Institute for Development Studies**  
*Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas*

## Monitoring Economic Vulnerability and Performance: Applications to the Philippines

*Josef T. Yap*

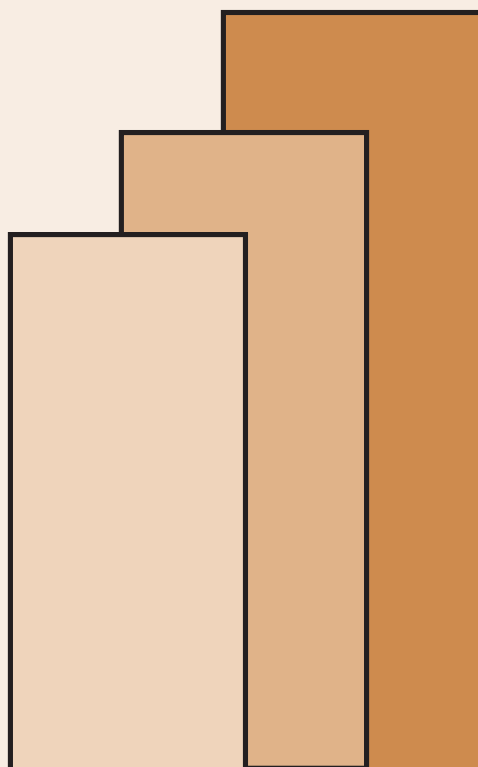
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# MONITORING ECONOMIC VULNERABILITY AND PERFORMANCE: APPLICATIONS TO THE PHILIPPINES<sup>1</sup>

Josef T. Yap<sup>2</sup>

## ***Abstract***

*The recent spate of banking and currency crises has underscored the need to develop early warning systems. These are based on economic indicators of vulnerability, which can be identified from models and theories of crises. First generation models focus on the inconsistency of macroeconomic policies and the exchange rate peg. Second generation models revolve around the possibility of self-fulfilling crises and multiple equilibria. Meanwhile, the 1997 East Asian financial crisis spawned research on third-generation models, which integrated balance sheets of banks and corporations in the framework of second-generation models. The next step is then to combine all the variables in a meaningful way that will allow the prediction of economic crises. There are two popular approaches: the probability model using limited dependent variables estimation and the signals approach of Kaminsky and Reinhart. Both these methodologies have their own advantages and disadvantages but their usefulness is constrained by the availability and timeliness of high-frequency data.*

*Key words: currency and banking crisis, early warning system, signals approach, probability approach*

## **I. Introduction**

As the East Asian economies recover from the 1997 financial crisis, there is increasing concern about a possible relapse. Economic growth in the five countries most affected by the crisis slowed in 2001 (Table 1) and the progress of corporate and financial reform has been patchy. First half data for 2002 indicate that the pace of economic growth for some countries is still below that of 2000. To address this concern, it is necessary to understand the nature of the recent crisis and implement appropriate policies that will minimize chances of similar incidents in the future. At the very least, a system must be developed that will help policymakers anticipate future crises.

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<p align="center"><b>Table 1</b> <b>GDP Growth Rates for 5 Most Affected East Asian Countries</b></p>					
	Indonesia	Korea	Malaysia	Philippines	Thailand
2000	4.8	8.8	8.3	4.0	4.4
2001	3.3	3.0	0.4	3.4	1.8
2002(1H)	2.9	6.0	2.4	4.1	4.5
Source: Asia Recovery Information Center. First half 2002 growth rate is an average of first two quarters.					

This paper looks at empirical work on early warning systems, particularly those that have been applied to the Philippine case. The theoretical underpinnings of these methodologies are discussed in Section II. There are two more popular approaches to modeling early warning systems, one where the probability of a crisis is estimated, and the signals approach of Kaminsky and Reinhart (1996). These two approaches will be discussed in more detail in Section III. The probability approach was applied by Gochoco-Bautista (2000) using Philippine data while Yap (2001) used the Kaminsky-Reinhart methodology. These studies will be discussed in Sections IV and V, respectively. The sixth section looks at macroprudential indicators as possible signals of vulnerability to a currency crisis. Empirical results using updated data and new indicators are then discussed in Section VII. The last section looks at structural indicators that affect the medium-to-long term economic growth prospects of the Philippines.

## II. Causes of Currency Crises

Interest in early warning systems has been revived after the spate of currency and banking crises in the 1990s. By monitoring key economic variables, policy makers would be able to anticipate a crisis, enabling them to avoid it or at very least, minimize its adverse impact. The contrasting view is that predicting a balance of payments (BOP) crisis or financial crisis is like predicting an earthquake, implying that an early warning system is practically useless. However, such an analogy refers only to the actual timing of the crisis whereas an early warning system is designed to signal an impending crisis. The exact moment is not crucial if there is sufficient lead time to react to the warning.

The variables used in an early warning system are normally derived from theories of the causes of banking and BOP (or currency) crises. The literature distinguishes three types or, more precisely, three generations of models of BOP crises. The first generation models have their roots in Krugman's 1979 seminal paper, which stressed that crises are caused by weak economic fundamentals that become inconsistent with a pegged exchange rate. Typically, the source of deteriorating fundamentals is a fiscal deficit that is financed by a continuous expansion of domestic credit. The peg is sustained by a positive stock of foreign exchange reserves, but in a small open economy, these reserves are gradually depleted as agents buy foreign currency owing to the imbalance between the expanding domestic credit and the stable money demand. The persistent loss of international reserves ultimately forces authorities to abandon the fixed exchange rate regime and the currency depreciates over time to reflect the expansion in domestic credit.

The description of the foregoing model suggests specific indicators that could be monitored. Prior to the onset of the currency crisis, there may be a gradual but continual decline in the level of international reserves accompanied by rapid growth in Central Bank domestic credit and a widening fiscal deficit. It would also be useful to monitor the growth rate of domestic credit in excess of growth in money demand.

Other models have extended Krugman's analysis and suggest more indicators for monitoring. With some degree of stickiness in the price of traded goods, expansionary fiscal and monetary policies would raise the demand for traded goods, which worsens the trade balance. Demand for nontraded goods would also rise, which raises their relative prices and leads to an appreciation of the real exchange rate (Calvo, 1987). Meanwhile, by introducing some degree of uncertainty, the timing of the devaluation cannot be exactly predicted and a "peso problem" emerges, that is, a persistent divergence between nominal domestic and foreign interest rates owing to the expectation of an impending devaluation.<sup>3</sup>

Following the collapse of the European Monetary System (EMS) in 1993, later models of currency crises dealt with cases where the depletion of international reserves might not be at the root of currency crises. The second-generation models conjecture that speculative attacks can occur even when policies are consistent and economic fundamentals are strong (Obstfeld 1986,1996). These models focus on the role of agents' expectations in the formulation of the different, and oftentimes conflicting, policies of government policymakers. The public, in turn may base its actions on expected fundamentals conditional on an attack taking place, rather than current economic fundamentals absent an attack. Such situations give rise to the possibility of self-fulfilling hypotheses.

In a regime of soft pegs, the important feature is the relationship between the public's expectations and the government's assessment of the costs of maintaining the peg. For example, for the twin goals of reducing inflation and achieving a target economic growth rate, fixed exchange rates may help achieve the first goal but at the cost of a loss of competitiveness and a recession. If the government senses that the public expects an abandonment of the peg, it may raise interest rates to defend the currency. This will raise the cost to the government of defending the peg and once this becomes too high, the peg would likely be abandoned. If the public correctly anticipated the abandonment of the peg, the result would be a self-fulfilling prophecy. However, it is also possible that the expected attack on the currency is unsuccessful or that the government incorrectly diagnosed the mood of the public, resulting in the maintenance of the peg. The contingent nature of second-generation models gives rise to multiple equilibria and non-uniqueness.

Indicators related to second-generation models can be derived from the objectives of economic policy. Hence, currency depreciation pressures would increase when output is sluggish, domestic inflation is relatively high, or there are deficits in the current

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<sup>3</sup> Quoted from Berg, et al (1999), page 26.

account. Investor sentiment would also influence the viability of the peg. Stock prices are a good gauge of future profits while market surveys directly reflect the expectations of economic agents.

Corollary to the possibility of self-fulfilling crises is the role of contagion effects. It is useful to distinguish between fundamentals-based contagion, which arises when a crisis country is linked to others via trade or finance, and pure contagion. The latter emanates from actions of investors and is therefore more closely related to the second-generation models of BOP crises.

Kaminsky and Reinhart (2000) analyzed various forms of fundamentals-based contagion. One, is through a common international bank creditor, wherein a bank reacts to a rise in the nonperforming loans in one country by pulling out of high risk projects elsewhere, most likely in other emerging markets. Another mechanism is through liquidity channels, mutual funds and cross-market hedging, which has been described as an indirect financial channel (Kim, et al. 1999). Losses in one country could lead international investors to pull out their investment in other developing countries to meet a specified capital-adequacy ratio or margin calls, or to resolve their liquidity constraints. A contagious crisis can take place if these international investors suddenly and simultaneously change their investment positions in several countries.

The contagion mechanism that has received most attention is via trade channels. Two types of trade links were examined by Kaminsky and Reinhart. One is bilateral trade among other countries and the crisis country. The other is involves competition in a common third market and is more difficult to quantify.

Meanwhile, pure contagion is related to changes in the behavior of international investors, which are not caused by systemic or mechanical changes in their portfolio composition but by shifts in their perception toward market risks (Kim, et al. 1999). One theory in this category assumes that international investors follow “herd behavior” in portfolio and risk allocations. This is brought about by the incentive scheme among fund managers, which penalizes those who deviate on the low end from the average performance of a regional portfolio.

Another form of pure contagion is what is termed “informational cascade,” wherein instead of evaluating countries individually, investors tend to lump them in one group. Hence investors pay little heed to countries' economic fundamentals and do not discriminate properly among countries. Thus, for instance, if investors pull out their investment from Thailand, they would simultaneously lower their portfolio investment in Southeast Asia.

Recent empirical work has focused on incorporating an appropriate measure of contagion (Kaminsky and Reinhart, 2000; Zhang, 2001). Some approaches will be discussed in Section VII.

The 1997 East Asian crisis has been classified as a second-generation type due to the sudden shift in investor sentiment. The abrupt and large withdrawal of foreign capital in anticipation of economic difficulties led to an actual deterioration of the economies. Contagion has figured prominently in the analysis, too. However, Yoshitomi and Ohno (1999) argued that the depth and duration of the Asian crisis could not be explained sufficiently by the second-generation model. The Asian crisis reveals a need to incorporate the problems of the financial sector with its balance sheet effects, a sharp reversal of capital flows, a plunge in absorption, and a free fall of the exchange rate. In a recent paper, Krugman (2001) discusses several variants of future models of BOP crises, but emphasizes the balance-sheet effects of a currency depreciation.

The relevant indicators that can be derived from this analysis are related to the double mismatch problems of the banking system: a mismatch in terms of maturity and currency. A maturity mismatch is generally inherent in the banking industry but this was amplified during the 1997 crisis because a significant amount of capital inflows into East Asia was short-term. On the other hand, the currency mismatch resulted from substantial unhedged foreign borrowing. Hence, indicators to monitor are the ratio of short-term debt to foreign exchange reserves and the ratio of foreign exchange liabilities to total liabilities.

BOP crises can also be a direct consequence of banking crises the causes of which are not related to macroeconomic imbalances. As a matter of fact, many of the recent currency crises were preceded by banking crises (Kaminsky and Reinhart, 1996). The need to bail out the financial system may result in excessive domestic credit growth leading to a speculative attack on the currency. Thus, a review of the literature on banking crises would also yield useful indicators to monitor. This would include many financial soundness indicators like the capital adequacy ratio, sectoral credit concentration, loans-to-deposit ratio, bank profitability ratio, and debt-equity ratios of bank borrowers.

### **III. Methodology**

Literature on the different indicators and various methodologies employing them is aptly reviewed by Kaminsky et al. (1998). They also provide a list of the main indicators used in empirical work classified by category (capital account, debt profile, current account, international variables, financial liberalization, real sector, fiscal variables, institutional/ structural factors, and political variables).

Four methodological categories are cited in the review paper. Two of them have been prominent in recent literature. The first estimates the probability of a devaluation, or more broadly, the probability of a crisis, based on regression estimates using any one of the limited dependent variables techniques. One such application is that of Demirguc-Kunt and Detragiache (1998) who studied factors associated with the emergence of systemic bank crises in a large sample of developed and developing countries using a multivariate logit model. Some of the variables they found significant are real interest

rates, economic growth, inflation, and M2/reserves ratio. In some variations of their regression model, they found institutional variables, such as the presence of deposit insurance and law and order, significant.

An earlier probability model was that of Frankel and Rose (1996), which was motivated by the Mexican crisis. They applied a probit model to test the hypothesis that certain characteristics of capital flows are associated with currency crashes. Unfortunately, their use of annual data limits the use of their model as an early warning system.

Meanwhile, the IMF estimated a probit model to determine which variables contribute to the probability of a crisis occurring within the following 24 months. It has been termed the Developing Country Studies Division (DCSD) model. As argued by Berg, et al (1999), the probability model has two advantages: the model can aggregate predictive variables more satisfactorily into a composite probability, taking account of correlations among variables; and it is easy to test for the statistical significance of individual variables. In addition, it is possible to allow the risk of a crisis to increase linearly with the predictor variables.

Nevertheless, this methodology has some important limitations. First, it is argued, albeit incorrectly, that the probability approach does not provide a metric for ranking indicators according to their ability to accurately predict crises and avoid false signals, since a variable either enters the regression significantly or it does not. While measures of statistical significance can help pinpoint the more reliable indicators, they provide no information on whether the relative strength of a particular indicator lies in accurately predicting a high proportion of crises at the expense of sending numerous false alarms, or instead missing a large share of crises but seldom sending false alarms. However, by calculating the slope coefficient in the estimated equations, one can rank the variables in terms of their influence on the probability of a crisis.

Second, this method does not provide a transparent reading of where and how widespread macroeconomic problems are. Within this approach, it is difficult to assess which of the variables is "out of line," making it less than suited for surveillance and pre-emptive action.<sup>4</sup> Third, there is evidence that the ability of the probability approach to generate accurate forecasts tapers off quickly as the forecast horizon moves beyond one period ahead. Finally, in order to function as an early warning system, a suitable lag framework must be incorporated in the estimation procedure. This may cause problems if the lag variables are not significant or if the degrees of freedom are substantially reduced.

The shortcomings of the probability approach are addressed by the "signals" approach developed by Kaminsky and Reinhart (1996). The step-by-step procedure has been discussed extensively (Kaminsky et al. 1998, Kaminsky and Reinhart 1996) and we adopt the discussion of Goldstein (1998).

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<sup>4</sup>The discussion on the limitations of the probability approach is quoted from Kaminsky et al. (1998).



First, a sample of countries must be identified. It is possible to base the analysis on just one country, but the limited number of crises will prevent a robust generalization on the usefulness of indicators.

Second, the definition of a crisis must be delineated. Kaminsky and Reinhart define a bank crisis in terms of bank runs, closures, and mergers, or large-scale public sector takeovers of important financial institutions. For currency crises, they construct an index of exchange market pressure by taking a weighted average of changes in nominal exchange rates and changes in international reserves; when the nominal exchange rate depreciates and international reserves fall, exchange market pressure is greater. Extreme values of this index—that is, readings of three or more standard deviations above the mean—signal currency crises.

Third, the term "early" must be defined. For currency crises, Kaminsky and Reinhart define early as between 1 month and 24 months before the beginning of the crisis. For banking crises, a laxer definition is adopted, namely, either 1 month to 12 months before the start of the crisis or up to 12 months after the beginning of the crisis. This is because banking crises frequently last 4 to 5 years—much longer than currency crises (typically less than a year)—and because the peak of a banking crisis often takes place several years after it starts.

The signals approach has been criticized as being arbitrary in delineating a period that is considered "early" (Demirguc-Kunt and Detragiache 1998). Corollary to this, it should be noted that indicators have different lags in their impact on the economy. Hence, the definition of an "early" period may vary from country to country. The definition of Kaminsky and Reinhart was retained in this study.

The fourth task is to pick out a list of potential early warning indicators. Knowledge of the theoretical causes of currency and banking crises provides a basis for identifying possible indicators that signal a crisis. For example, based on Generation I models (which emphasize macroeconomic variables out of line), economic variables to watch out for are excessive monetary growth, deteriorating fiscal balances, and rapidly depleting international reserves. Another criterion used for selecting an indicator is the availability of high-frequency data. A list of indicators used by Kaminsky and Reinhart that were applied by Yap (2001) is presented in Table 4, Section V below. The list includes a brief explanation of each variable.

Given the indicators, step number five is to find an optimal threshold for each indicator that, once reached, will give an accurate signal of a future crisis. The point at which an indicator signals a crisis must be set. Thresholds are determined using an iterative procedure. Given an indicator  $X$ , an arbitrary tail of the frequency distribution for  $X$ —say the 10 percent tail—is set. Depending on the nature of  $X$ , it can be the upper or lower tail. Any observation that falls in the 10 percent tail of the time series of  $X$  is regarded as a signal. It is considered a true signal if a currency crisis occurs within 24 months after the signal was given, and a false signal (or noise) if no crisis occurs within

that early-warning time frame. Various thresholds are then experimented with until the optimal one is found. The optimal threshold maximizes the number of true signals and minimizes the number of false signals. The tail that minimizes the noise-to-signal ratio is used. Optimal thresholds as determined by Kaminsky and Reinhart were used by Yap (2001).

After applying the basic steps of the signals approach, the data for the indicators  $X_{jt}$ —indicator  $j$  at time  $t$ —are transformed in the following manner:

$$S_{jt} = 1 \text{ if the value of } X_{jt} \text{ crosses the threshold} \\ = 0 \text{ if otherwise.}$$

According to the definition of Kaminsky and Reinhart the indicator is considered good if in most of the cases when  $S_{jt}$  is 1, a BOP crisis occurs during the period  $t + 24$  months. As mentioned earlier, a laxer definition is adopted for banking crises— $S_{jt}$  assumes a value of 1 when  $X_{jt}$  crosses the threshold either 1 month to 12 months before the start of the crisis or up to 12 months after the beginning of the crisis.

The early warning system should enable policymakers to determine when the economy is becoming fragile. One way to facilitate analysis and make the system tractable is to compress the various indicators into a composite index. The most straightforward procedure is a simple count of flashing signals, which is the composite index labelled  $S$  by Kaminsky (1998) and defined as:

$$S_t = \sum_j S_{jt}$$

This statistic, however, does not fully use the information provided by univariate indicators because it does not account for the different forecasting accuracy of each variable. One way of combining this information is to weight the signals of different variables by the inverse of their noise-to-signal ratio. The second composite index, labelled  $K$ , is defined as:

$$K_t = \sum_j \frac{S_{jt}}{n_j}$$

where  $n_j$  is the noise-to-signal ratio of indicator  $j$ . In this exercise we applied the noise-to-signal ratios calculated by Kaminsky and Reinhart.

The above composite leading indicators assign the same weight to a signal provided by a mild anomalous behavior of a variable and that provided by an extreme aberrant behavior of that variable. To account for this distinction, two different thresholds can be defined for each indicator: a mild threshold  $Y_m$  and an extreme threshold  $Y_e$ .  $|Y_m| < |Y_e|$  and based on the criterion defined earlier,  $S_{jt} = 1$  when  $|X_{jt}| > |Y_{mj}|$ .  $Y_{mj}$  is the mild critical threshold for indicator  $j$ .

An extreme signal  $D$  is then defined based on  $Y_e$  such that  $D_{jt} = 1$  when  $|X_{jt}| > |Y_{ej}|$ . Note that  $S_{jt} = 1$  whenever  $D_{jt} = 1$ . The third composite indicator that accounts for the intensity of the signal of each univariate indicator, labelled  $W$ , is defined as:

$$W_t = \sum_j (S_{jt} + D_{jt})$$

Time series probability forecasts are then computed to evaluate the reliability of each of these composite indices. We can construct a sample-based vector of conditional probabilities:

$$\begin{aligned} \Pr(Ct_{t+h} | S_t = I) &= \frac{\text{Months with } S_t = I \text{ and a crisis within } h \text{ months}}{\text{Months with } S_t = I} \\ \Pr(Ct_{t+h} | K_t = I) &= \frac{\text{Months with } K_t = I \text{ and a crisis within } h \text{ months}}{\text{Months with } K_t = I} \\ \Pr(Ct_{t+h} | W_t = I) &= \frac{\text{Months with } W_t = I \text{ and a crisis within } h \text{ months}}{\text{Months with } W_t = I} \end{aligned}$$

#### IV. Application of the Probability Approach to the Philippine Case

The methodology used by Gochoco-Bautista (2000) is quite straightforward. First, she identifies relevant indicators based on the aforementioned models of economic crises. Second she divides the sample period into tranquil and crisis or pressure periods based on the following procedure. An arbitrary band is constructed by taking the mean of percentage changes in the nominal exchange rate plus or minus 1.5 times the standard deviation of changes in the exchange rate. Those periods in which percentage changes in the exchange rate fall outside the 1.5 times the standard deviation band are included as pressure periods. From the remaining non-selected observations, periods where percentage changes in gross international reserves are outside the 1.5 times standard deviation band are selected as pressure periods. From the remaining non-selected observations after this, periods where changes in logs of short-term interest differentials between the Philippine 91-day Treasury bill rate and the US 3-month Treasury bill rate are outside the 1.5 times standard deviation band are selected as pressure periods. The remaining non-selected observations are identified as periods of tranquility.

So as not to identify an ongoing speculative episode as a new one, a five-month exclusion window is used. For example, periods identified by changes in gross-international reserves were not treated as a separate speculative episode if they fell within the five-month window of an episode previously identified by changes in the exchange rate.

The third step is to examine whether there are differences in the behavior of the indicator variables during tranquil periods and pressure periods. This is done by comparing the mean values of month-to-month changes in these variables. A selection of

the variables and the results are shown in Table 2. Gochoco-Bautista stresses that it is important to test the robustness of the findings with respect to how the pressure periods are selected and to see whether the story told by the mean values of the variables is consistent across these periods. This is done by first calculating the mean values of the variables using pressure periods identified using only the percentage changes in the exchange rate (Case A in Table 2). Next, the same exercise is repeated using both percentage changes in the exchange rate and in gross international reserves to identify the pressure periods (Case B). Finally the mean values of the indicator variables are calculated when pressure periods are identified using percentage changes in the exchange rate, in gross international reserves, and changes in the logs of short-term interest rate differentials (Case C).

Gochoco-Bautista argues that if there are differences in the behavior of these variables during tranquil periods and during periods of speculative pressures, then there may be some evidence to show inconsistent macroeconomic policies. On the other hand, if there are no discernible differences in the means of these variables during tranquil periods and during periods of speculative pressures, then it is possible that arbitrary shifts in expectations are largely responsible for currency pressures.

The fourth step is to use a probit model to formally test the statistical significance of the indicator variables on the probability that speculative currency pressures will occur. The dependent variable distinguishes between pressure periods and tranquil periods. It is 1 during periods of currency pressure and 0 during tranquil periods. Currency pressure periods are not distinguished by whether they are depreciation pressure periods or appreciation pressure periods. Three different specifications of the dependent variable are used, depending on how the currency pressure periods were identified. The dependent variables D1, D2, and D3 correspond to Case A, Case B and Case C as defined earlier. An example of estimation results is presented in Table 3.

<b>Table 2</b> <b>Stylized Facts: Behavior of Indicator Variables (partial)</b>			
Indicator Variable	Tranquil Period Mean	Depreciation Pressure Mean	Appreciation Pressure Mean
Change in Nominal Exchange Rate			
A	0.28%	14.51%	-6.55%
B	0.27%	11.46%	-1.88%
C	0.29%	8.16%	-1.70%
M3 Multiplier			
A	3.10	3.30	2.83
B	3.11	3.23	2.84
C	3.11	3.22	2.84

Growth in Total Domestic Credit			
A	1.45%	3.98%	-1.04%
B	1.58%	3.23%	-1.54%
C	1.55%	3.19%	-1.54%
Growth in Total Bank Deposits			
A	1.43%	4.30%	1.93%
B	1.39%	3.86%	2.20%
C	1.37%	3.30%	2.14%
Inflation			
A	0.91%	1.45%	1.23%
B	0.89%	1.27%	1.35%
C	0.89%	1.13%	1.53%
GIR Growth			
A	1.48%	-6.45%	12.08%
B	0.81%	-10.09%	24.59%
C	0.71%	-5.99%	22.46%
Interest Rate Differential			
A	8.70%	13.66%	18.83%
B	8.59%	12.38%	14.02%
C	8.70%	10.74%	12.67%
M3/GIR			
A	4.42	6.90	5.41
B	4.36	6.50	5.58
C	4.40	5.75	5.16
Trade Balance (USD mil.)			
A	-334	-368	-199
B	-344	-322	-154
C	-347	-309	-151
Nat'l. Power Corp. Sales Growth			
A	0.66%	1.21%	0.15%
B	0.77%	0.83%	-1.25%
C	0.68%	1.28%	-0.44%
Source: Gochoco-Bautista (2000), p. 133			

<b>Table 3</b> <b>Example of Results Using Probit Estimation</b>						
Dependent Variable	Indicator Variable	Coefficient	t-stat	Probit slope coefficient	Durbin Watson	Likelihood Ratio
D3	IDIFF(-1)	3.30	2.01	0.65	2.02	0.47
	GIRG(-1)	-1.55	-1.58	-0.31		
	NPCG(-1)	-3.55	-1.88	-0.71		

D3	IDIFF(-1)	4.06	2.27	0.78	2.04	0.49
	GIRG(-1)	-2.34	-2.21	-0.45		
	NPCG(-1)	-3.37	-1.71	-0.65		
	DCPUBG(-1)	3.40	2.61	0.65		
<p><i>IDIFF- interest rate differential; GIRG – month-on-month growth in international reserves; NPCG – month-on-month growth in NPC sales; DCPUBG – month-on-month growth in credit to public sector. NOTE: Since probit coefficients are not easily interpretable, the probit slope coefficients are given. They show the effects of one unit changes in regressors on the probability of currency pressures arising, evaluated at the mean of the data. Source: Gochoco-Bautista (2000), Table 4, p. 146.</i></p>						

Based on her findings, Gochoco-Bautista outlines the following conclusions:

1. Indicator variables such as the M3 multiplier, growth in total domestic credit, growth in domestic credit to the private sector, growth in total bank deposits, M3/GIR, M3/GIR growth, growth of GIR, and growth of National Power Corporation (NPC) sales tell a consistent story. It is that overly expansionary policies are associated with depreciation pressure periods.
2. There is little evidence for second-generation models, in which stylized facts reflect economic conditions that make it costly for the government to maintain a peg. In particular, the results suggest that inflation is higher and output growth lower during appreciation pressure periods. If the authorities were trying to counteract recession, for example, they would pursue expansionary policies which would lower domestic interest rates and raise inflation, but which lead to depreciation rather than appreciation pressures.
3. Overly expansionary monetary and fiscal policies, and increasing overvaluation of the domestic currency are associated with depreciation pressures. The findings suggest that weak economic fundamentals resulting from policies inconsistent with exchange rate stability, rather than arbitrary shifts in expectation, are probably more important in explaining the probability of pressures on the domestic currency.
4. In general, the full sample results of the probit estimation show that economic fundamentals matter as far as the probability of currency pressures arising is concerned. Among the indicators, those representing capital account developments, such as changes in gross international reserves, and short-term interest differentials between domestic and foreign rates, current account developments, such as (contemporaneous) changes in the real exchange rate, real sector indicators, such as output growth proxied by sales of the National Power Corporation, and fiscal variables such as the growth of domestic credit to the public sector have a statistically significant effect on the probability of currency pressures occurring.

The empirical tests in this study consistently apply only one lag period for the explanatory variables. This would not allow the results to be used as an early warning system, a shortcoming of the probability approach that was cited in Section III. It would also seem inappropriate to use as explanatory variables indicators that were used to define the dependent variable. For example, in Table 3, the variable D3 was defined based on exchange rate movements, the growth of international reserves and the interest rate differential. However, the probit equation uses IDIFF and GIRG as explanatory variables and raises the possibility that the results are spurious.

The regression results also represent an “average” of the behavior over the sample period, which does not necessarily apply to the 1997 crisis episode. The explanatory variables should be examined individually to determine if there was abnormal behavior prior to July 1997. While the estimated probability of a crisis did rise at this time, it would be difficult to judge whether or not this was already a reaction to the brewing regional crisis. An explicit variable accounting for the possibility of contagion must therefore be included.

## V. Application of the Kaminsky-Reinhart Methodology to the Philippines

The indicators that were used by Yap (2001) are listed in Table 4. The probability tables obtained using the three composite indicators described in Section II are shown in Table 5.

<p style="text-align: center;"><b>Table 4</b> <b>Indicators of Currency and Financial Crises</b></p>
<p><b><u>Financial sector</u></b></p> <ol style="list-style-type: none"> <li>1. <b>M2 multiplier:</b> A higher multiplier indicates higher growth in money supply which may lead to higher inflationary expectations and expectations of a future devaluation of the currency.</li> <li>2. <b>Domestic credit:</b> A larger amount of credit increases the chances of bad loans and bank failures. Higher credit also implies a larger amount of money supply.</li> <li>3. <b>M2/Reserves:</b> Economic agents fearing a devaluation may substitute local currency for foreign currency. The M2/Reserves ratio is an indication of the extent to which the Central Bank can withstand this pressure.</li> <li>4. <b>Lending/Deposit rate:</b> A higher spread indicates that the Central Bank is increasing interest rates to stem credit growth. Higher lending rates increase the chances of bad loans.</li> <li>5. <b>Deposits:</b> A decline in the deposit base increases the chances of a bank run.</li> <li>6. <b>Real interest rate:</b> Higher interest rates increase the probability of loan defaults.</li> <li>7. <b>Excess money balances:</b> Equilibrium real M1 balance was estimated using the Hodrick-Prescott filter. The difference between actual and equilibrium values is equal to the excess money balances.</li> </ol>

### **External sector**

Note that variables from the external sector can be leading indicators of a banking crisis because of the relationship of a BOP crisis and banking crisis.

1. **Exports:** Lower export growth may signal problems with the trade balance.
2. **Imports:** Higher import growth may signal problems with the trade balance.
3. **Real exchange rate:** The equilibrium real exchange rate is estimated using the Hodrick-Prescott filter that allows for stochastic trends. The difference (ratio) between the actual value and the equilibrium value is a measure of the degree of overvaluation. The real exchange rate published by JP Morgan was used in the computations.
4. **Reserves:** This is the classic indicator based on Krugman's seminal paper on BOP crises. A low level of reserves—below a critical threshold—may trigger a speculative attack against the currency.
5. **Interest rate differential:** This is defined to be foreign interest rates (as measured by the 90-day US Treasury Bill rate) less domestic interest rate (91-day Treasury Bill rate). The higher the differential, the larger is the probability of an outflow of reserves.

### **Real sector**

1. **Output growth:** Lower output growth indicates a deceleration of the economy prior to a crisis. A modification would be to take the first difference of output growth to reflect more accurately an economic deceleration. The value index of manufacturing output was used and this was deflated by the consumer price index (CPI) to obtain an index in real terms.
2. **Stock market prices:** A decline in the growth rate of asset prices may lead to loan defaults. It also signals a loss of investor confidence. This index was not included in this paper because of lack of data prior to 1987.

NOTE: Due to data constraints the last two indicators were not incorporated in Yap (2001).

**Table 5**  
**Probability tables for composite indices**

<b>S Composite Index</b>		<b>W Composite Index</b>	
<u>S<sub>j</sub></u>	<u>Pr(BOP Crisis)</u>	<u>W<sub>j</sub></u>	<u>Pr(BOP Crisis)</u>
0	0.07	0	0.07
1	0.12	1	0.07
2	0.29	2	0.21
3	0.43	3	0.51
4-5	.67	4	0.14
		5	0.60
		6 and above	0.20
Brier's QPS: 0.29		Brier's QPS: 0.19	



<b>K Composite Index</b>	
<u>K<sub>j</sub></u>	<u>Pr(BOP Crisis)</u>
0.0 - < 1.0	0.07
1.0 - <2.0	0.10
2.0 - <3.0	0.18
3.0 - <5.0	0.34
5.0 - < 7.0	0.67
7.0 - above	0.87
Brier's QPS: 0.21	

The Brier's quadratic probability score is a measure of goodness-of-fit and the results indicate that the K index is the better indicator among the three.

Empirical results using Kaminsky-Reinhart methodology indicate that the economic fundamentals of the Philippines were much sounder prior to the 1997 crisis than in the 2-year interval prior to the October 1983 BOP crisis. In another paper (Yap 1999) the methodology was extended to 11 other countries: Indonesia, Korea, Malaysia, Thailand, Denmark, Finland, Norway, Sweden, Mexico, India, and Pakistan. The first four countries plus the Philippines comprise the Asian 5, the economies hardest hit by the crisis. Key results can be summarized by ranking the cases based on the number of indicators flashing on a regular basis:

1. The Asian 5 during their respective economic crises prior to the 1997 debacle (e.g., the Philippines in 1983).
2. The Scandinavian countries during their crises in the late 1980s and early 1990s.
3. The Mexican crisis in 1994.
4. Pakistan prior to the 1997 crisis.
5. The Asian 5 prior to the 1997 crisis.

Results generally indicated that fundamentals cannot explain the depth of the 1997 crisis because the other episodes did not have as severe an impact—especially in the number of countries involved—and yet the fundamentals were weaker. This is another indication that a contagion variable must be included in the analysis.

## **VI. Other Indicators of Vulnerability**

A weakness of both the studies of Gochoco-Bautista and Yap is that the variables directly related to the 1997 crisis were not included in the methodology. Examples are the amount of short-term foreign debt and the exposure of domestic banks to the real estate sector. Unfortunately these variables are not available on a high frequency basis, which is the reason why they were not included. If, indeed, the next generation crises would revolve around balance sheets of firms and other economic entities (including the government) then effort must be exerted to gather the relevant data. Not only will frequency be an issue, but timeliness of reporting as well.

A useful transitional step would be to improve on macroprudential indicators (MPIs), which are broadly defined as indicators of the health and stability of the financial system. They comprise both macroeconomic indicators that affect the financial system (e.g. fiscal deficit) and aggregated microprudential indicators. The latter are obtained by aggregating indicators of individual financial institutions while the former are already covered by indicators used by Gochoco-Bautista and Yap.

One commonly used framework for analyzing the health of financial institutions using aggregated microprudential indicators is the so-called CAMELS framework (IMF 2000). This involves the analysis of six group of indicators as follows:

- Capital adequacy
- Asset quality
- Management soundness
- Earnings
- Liquidity
- Sensitivity to market risk.

Theoretically, the variables will not be of equal importance. However, the overriding criterion for choice would be data availability.

#### A. Capital Adequacy

Capital adequacy and availability ultimately determine the robustness of financial institutions to shocks to their balance sheets. The most commonly used indicator in this respect is the aggregate risk-based capital ratio (the ratio of capital to risk-adjusted assets). A declining trend in this ratio may signal increased risk exposure and possible capital adequacy problems. In addition to adequacy, it may also be useful to monitor indicators of capital quality. Bank capital consists of different elements that have varying availability and capability to absorb losses.

#### B. Asset Quality Indicators

Risks to the solvency of financial institutions often derive from impairment of assets, so it is important to monitor indicators of asset quality. These include indicators at the level of the lending institution, and indicators at the level of the borrowing institutions.

*1. Sectoral Credit Concentration.* A large concentration of aggregate credit in a specific economic sector or activity, especially real estate, may signify an important vulnerability to the financial system to developments in this sector or activity (e.g. fall in profit due to overinvestment). Data showing the disaggregation of outstanding credit

across various sectors is generally available. The share of manufacturing and real estate are reported when data are available.

2. *Foreign currency denominated lending.* Several financial crises have been preceded by periods of fast growth of foreign-currency denominated credit to domestic firms that frequently lacked a stable source of foreign exchange reserves. Another situation is when banks intermediate foreign capital inflows, thus increasing their foreign exchange liabilities. .

3. *Nonperforming loans.* An increasing trend in the ratio of nonperforming loans to total loans signals a deterioration in the quality of credit portfolios and consequently, in financial institutions' cash flows, net income and solvency.

4. *Indicators at the Level of the Borrowing Entity.* This subgroup refers to indicators that take into account the likelihood that borrowers can repay their loans. The most common are corporate debt-equity ratios. Unfortunately, these data are not readily available.

#### C. Management Soundness Indicators

Indicators of the quality of management are primarily applicable to individual institutions and cannot be easily aggregated across the sector. Although aggregated indicators can be used, they are more likely to reflect financial sector structure and/or the country's economic situation, than management quality.

Bloomberg reports an efficiency ratio for a selected number of banks for the five countries. The efficiency ratio is equivalent to the expense ratio suggested by the IMF document. The data are available only on an annual basis.

#### D. Earnings and Profitability Indicators

It is important to monitor indicators of profitability because chronically unprofitable financial institutions risk insolvency. On the other hand, unusually high profitability may be a sign of excessive risk taking. However, it should be noted that similar to management soundness indicators, aggregation across individual banks may not yield useful numbers.

Bloomberg reports two common profitability indicators: return on assets and return on equity. These ratios are aggregated across the top ten reporting banks using total assets as weights.

#### E. Liquidity Indicators

Initially solvent financial institutions may be driven toward closure by poor management of short-term liquidity, so it is important to monitor liquidity indicators. On

the liability side, indicators should cover funding sources, including interbank and central bank credits.

1. *Central Bank Credit to Financial Institutions.* A large increase in central bank credit to banks and other financial institutions—as a proportion of their capital or their liabilities—often reflects severe liquidity problems in the financial system. Because of data considerations, we obtain the ratio of central bank credit to financial systems (or the private sector) to the monetary base.

2. *Loans-to-Deposits Ratios.* The ratio of credit to total deposits may give indications of the ability of the banking system to mobilize deposits to meet credit demand. A high ratio may indicate stress in the banking system and a low level of liquidity to respond to shocks.

#### F. Sensitivity to Market Risk Indicators

This set of indicators looks at the various components of market risk, the most significant of which are interest rate and foreign exchange risk. The latter is captured to a certain extent by the share of foreign liabilities of the banking system to total liabilities. The IMF document does not give a specific indicator to measure interest rate risk.

#### G. Market-Based Indicators

Market-based assessments of the financial sector as implied by the prices (yields) of financial instruments and the creditworthiness ratings of financial institutions and large corporations, are also useful indicators of financial system vulnerability. Another useful market-based indicator, which is readily available, is the stock prices of the financial sector relative to average stock prices.

The CAMELS system, particularly the capital adequacy ratio, has been described as inadequate for emerging market economies by Rojas-Suarez (2001). Two reasons are cited. One, because of severe deficiencies in the accounting and regulatory framework and the high concentration of wealth in emerging markets, the meaning of traditional ratios is extremely limited. Because of poor or unrealistic accounting standards, for example, there will be a divergence between the market value of an asset and its book value. Two, bank ratios become less effective when liquid markets for bank shares, subordinated debt and other bank liabilities and assets are not available to validate the “real” worth of a bank as opposed to its accounting value.

Rojas-Suarez then proposes alternative indicators for banking problems in emerging markets based on the general principle that good indicators of banking problems are those that reveal the “true” riskiness of individual banks because they are

based on markets that work rather than just relying on accounting figures. The indicators that she proposes are: 1) implicit interest rate paid on deposits; 2) spread between lending and deposit rates; 3) rate of loan growth; and 4) growth of interbank debt. Significant changes in these variables indicate a change in the risk-taking behavior of banks.

The methodology applied by Rojas-Suarez is a two-step approach, which she applies to six countries: Mexico, Venezuela, Colombia, Thailand, Korea and Malaysia. The means of the variables are computed for tranquil and crisis periods and it determined whether the differences are significant. Rojas-Suarez then applies a modified version of the Kaminsky-Reinhart signals approach to determine the ability of each indicator to predict a crisis. The empirical results show that interest paid on deposits and interest rate spreads have proven to be strong performers by showing a high degree of accuracy in predicting bank problems.

Given the possibility of self-fulfilling crises, another important indicator for monitoring and surveillance can be derived by undertaking regular market surveys among economic agents to obtain a feel of their sentiments and expectations. In addition Harding (1998) suggests that multiple equilibria in modelling time series be explicitly accounted for. Nonlinear models that account for endogenous changes in asset prices will be useful.

## VII. Updated Empirical Results

In this section, we present the results of empirical tests which use updated data and attempt to address the shortcomings of the studies of Gochoco-Bautista and Yap (2001). The areas of improvement include consideration of more indicators, including a measure of contagion.

### *Measures of Contagion*

A significant improvement in this study over previous ones on the Philippines is the explicit consideration of contagion. Many recent studies have incorporated a measure of contagion in the empirical analysis. For example, Eichengreen, Rose and Wyplosz use panel data to test the existence of contagion effect by estimating the following model:

$$\text{Crisis}_{j,t} = \alpha D(\text{Crisis}_{i,t}) + \lambda \text{Macro}_{j,t} + \varepsilon_{j,t}$$

where  $\text{Crisis}_{j,t}$  is a dummy variable for country  $j$  at time  $t$ , constructed using a procedure similar to that of identifying pressure periods;  $D(\text{Crisis}_{i,t})$ , the contagion variable, takes the value of 1 if the crisis dummy for any country  $i$  ( $i \neq j$ ) in the sample is 1;  $D(\text{Crisis}_{i,t})$  is 0 otherwise; and  $\text{Macro}_{j,t}$  contains current and lagged macroeconomic variables for country  $j$ .

Other studies are surveyed by Zhang (2001), who also proposed his own methodology. This revolves around the use of a duration variable to capture the changes

in the frequency of attacks, which might be an important factor influencing investors' expectations. However, implementing Zhang's proposal requires using the Autoregressive Conditional Hazard (ACH) model, which—given the existing econometric software packages—is not a straightforward procedure.

Instead we use a variant of the Eichengreen, Rose and Wyplosz approach in the context of the channels of contagion identified by Kaminsky and Reinhart. In this case the Philippines is affected through the bank credit channel by crises originating in Latin American countries since the bulk of their liabilities are to US-affiliated banks. On the other hand, Japanese banks are the main creditors to China, Indonesia, Korea, Malaysia and Thailand.

Meanwhile, asset prices of the Philippines, particularly the stock index, are more highly correlated with neighboring East Asian economies. The same is true with regard to third party trade. The Philippines has similar patterns in terms of commodity structure and trade partners with Thailand and Malaysia, and to a certain extent Korea. This analysis reveals that currency crises originating in Latin America and East Asia will likely have an impact on the Philippines.

The contagion variable is defined as follows:  $CONTAGION_t$  equals 1 if there is a crisis originating in a Latin American or East Asian economy at time  $t$ , and zero otherwise. The timing of external crises is based on a list provided by Goldstein, Kaminsky and Reinhart (2000).<sup>5</sup> If a particular crisis occurs within 3 months of an identified pressure period in the Philippines then  $t$  is adjusted to be equal to the timing of the pressure period. The 3 month window is reduced to one month after 1992, at which time the capital account of the Philippines was liberalized. Both these time spans are arbitrary. This definition of the contagion variable is a bit loose since it does not distinguish between fundamentals-based contagion and pure contagion and also does not distinguish among the different channels of fundamentals-based contagion. However, it is still an improvement over earlier analyses that completely ignored this factor.

A more direct consideration of contagion is to include exchange rate movements of competing countries in the empirical tests. In this study, we used a weighted average of month-on-month changes in the exchange rate of Indonesia, Malaysia and Thailand. The weights were based on the share of these three countries in US imports.

### *Identifying Pressure Periods*

Zhang's proposal to identify pressure periods is based on the behavior of exchange rates and reserves. The Crisis dummy takes on the value of 1 if

$$\Delta e_t > 3\sigma_{\Delta e,t} + M_{\Delta e,t} \quad \text{or}$$

$$\Delta r_t < -3\sigma_{\Delta r,t} + M_{\Delta r,t}$$

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<sup>5</sup> Tables 2.1 and 2.2, pages 22-25.

where  $\Delta e_t$  and  $\Delta r_t$  are the changes in the nominal exchange rate and level of foreign exchange reserves respectively.  $\sigma_{\Delta e,t}$  is the standard deviation of  $\Delta e_t$  in the sample (t-36, t-1) and  $M_{\Delta e,t}$  is the mean of  $\Delta e_t$  in the same sample.  $\sigma_{\Delta r,t}$  and  $M_{\Delta r,t}$  are the corresponding statistics for foreign exchange reserves. In this context, pressure periods are those months when changes in the exchange rate or foreign exchange reserves take on extreme values. The time varying feature of the threshold is designed to avoid the regime changes.

This methodology is modified to include changes in the interest rate differential and a 2.5 standard deviation threshold instead of 3 standard deviations is used instead. We also look at the results of Gochoco-Bautista and include periods which she identified and are close to the threshold based on Zhang's methodology. The resulting pressure periods are listed in Table 6. Note that these are not all crisis periods.

<b>Table 6</b> Periods of Speculative Pressure Applying Methodology of Zhang (2001) and Incorporating Results of Gochoco-Bautista	
1980	80.4, 80.8, 81.3, 81.12, 82.10, 82.12, 83.06, 83.10, 84.01, 84.06, 84.10, 86.02
1990, 2000	90.01, 90.07, 90.11, 92.09, 95.09, 97.07, 97.09, 97.12, 98.6, 98.11, 99.02, 2000.10

#### *Re-estimated Probit Model*

Four equations were estimated. In the first, we constrained the sample to cover the major crises in the Philippines since 1980 and hence only indicators with data from 1980 onwards were considered. In the second, we considered all indicators and hence the sample period starts at the time all data are available. The results of the first two equations are shown in Tables 7 and 8.

**Table 7**

Probit Results with sample constrained to include 1980 onwards

Dependent Variable: CRISIS

Method: ML - Binary Probit

Date: 05/28/02 Time: 11:23

Sample(adjusted): 1980:01 2002:04

Included observations: 268 after adjusting endpoints

Convergence achieved after 7 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.846558	2.190534	-3.125520	0.0018
M1(-6)	5.210007	2.136224	2.438887	0.0147
M2M(-6)	0.025305	0.013407	1.887500	0.0591
ELEC(-4)	-0.054234	0.027369	-1.981602	0.0475
SP(-4)	-0.011388	0.005274	-2.159295	0.0308
CONTAGION	2.296141	0.373065	6.154794	0.0000
Mean dependent var	0.089552	S.D. dependent var		0.286073
S.E. of regression	0.228698	Akaike info criterion		0.425933
Sum squared resid	13.70330	Schwarz criterion		0.506328
Log likelihood	-51.07506	Hannan-Quinn criter.		0.458224
Restr. log likelihood	-80.80217	Avg. log likelihood		-0.190579
LR statistic (5 df)	59.45423	McFadden R-squared		0.367900
Probability(LR stat)	1.58E-11	Durbin-Watson Stat		1.85
Obs with Dep=0	244	Total obs		268
Obs with Dep=1	24			

Variable Definitions:

CRISIS – dummy variable which equals 1 during a pressure period

M1 – excess M1 balances

M2M – year-on-year growth rate of M2 multiplier

ELEC – year-on-year growth in electricity consumption (proxies as output)

SP – year-on-year growth in stock prices

CONTAGION – dummy variable defined earlier



<b>Table 8</b> <b>Probit Results with unconstrained sample</b>				
Dependent Variable: CRISIS				
Method: ML - Binary Probit				
Date: 05/30/02 Time: 06:59				
Sample(adjusted): 1987:09 2001:12				
Included observations: 172 after adjusting endpoints				
Convergence achieved after 7 iterations				
Covariance matrix computed using second derivatives				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.561647	0.521245	-4.914478	0.0000
STD_FXR(-2)	0.012930	0.007735	1.671579	0.0946
DC(-5)	0.045474	0.024112	1.885994	0.0593
DEFRATIO(-8)	17.48809	8.647058	2.022432	0.0431
M2M(-6)	0.055887	0.025956	2.153109	0.0313
ELEC(-4)	-0.187890	0.075310	-2.494875	0.0126
SP(-4)	-0.011200	0.007359	-1.521819	0.1281
CONTAGION	3.138423	0.709684	4.422284	0.0000
Mean dependent var	0.069767	S.D. dependent var	0.255498	
S.E. of regression	0.203162	Akaike info criterion	0.358605	
Sum squared resid	6.769056	Schwarz criterion	0.505000	
Log likelihood	-22.84004	Hannan-Quinn criter.	0.418001	
Restr. log likelihood	-43.52236	Avg. log likelihood	-0.132791	
LR statistic (7 df)	41.36464	McFadden R-squared	0.475211	
Probability(LR stat)	6.89E-07	Durbin-Watson Stat	1.89	
Obs with Dep=0	160	Total obs	172	
Obs with Dep=1	12			

**Variable Definitions:**

CRISIS – dummy variable which equals 1 during a pressure period  
STD\_FXR – ratio of short-term foreign debt to foreign exchange reserves  
DC – year-on-year growth of domestic credit in real terms  
DEFRATIO – year-on-year change of national government deficit as a ratio to electricity sales  
M2M – year-on-year growth rate of M2 multiplier  
ELEC – year-on-year growth in electricity consumption (proxies as output)  
SP – year-on-year growth in stock prices  
CONTAGION – dummy variable defined earlier

The results show a more useful lag structure than that of Gochoco-Bautista. For example, a sharp increase in the M2 multiplier signals possible pressure on the exchange rate six months hence. This gives ample time for policy makers to react and even gives allowance for lags in the release of data. Another major difference is that we eschewed using variables that were used in identifying pressure periods, e.g. growth in international reserves and interest rate differentials.

The variables that are significant in both equations are the M2 multiplier, monthly electricity consumption, the stock price index, and the contagion variable. The number of

lags are also the same. The only indicator that has a complete data set for the entire sample but did not turn up significant in Table 7 but did so in Table 8 is domestic credit.

The other two equations have the same specification but include the weighted average of exchange rate changes of competing countries. The results are reported in Tables 9 and 10.

<b>Table 9</b>				
Probit Results with sample constrained to include 1980 onwards including exchange rate of competing countries				
Dependent Variable: CRISIS				
Method: ML - Binary Probit				
Date: 05/28/02 Time: 11:28				
Sample(adjusted): 1980:01 2002:04				
Included observations: 268 after adjusting endpoints				
Convergence achieved after 7 iterations				
Covariance matrix computed using second derivatives				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.527663	2.245272	-2.907293	0.0036
M1(-6)	4.855289	2.190937	2.216079	0.0267
M2M(-6)	0.025158	0.013780	1.825631	0.0679
ELEC(-4)	-0.066148	0.028841	-2.293504	0.0218
SP(-4)	-0.010875	0.005367	-2.026237	0.0427
CONTAGION	2.402869	0.380879	6.308742	0.0000
WTDER(-6)	0.057330	0.025198	2.275167	0.0229
Mean dependent var	0.089552	S.D. dependent var		0.286073
S.E. of regression	0.226423	Akaike info criterion		0.415825
Sum squared resid	13.38079	Schwarz criterion		0.509620
Log likelihood	-48.72061	Hannan-Quinn criter.		0.453498
Restr. log likelihood	-80.80217	Avg. log likelihood		-0.181793
LR statistic (6 df)	64.16313	McFadden R-squared		0.397038
Probability(LR stat)	6.39E-12	Durbin-Watson Stat		1.80
Obs with Dep=0	244	Total obs		268
Obs with Dep=1	24			

**Variable Definitions:**

CRISIS – dummy variable which equals 1 during a pressure period  
M1 – excess M1 balances  
M2M – year-on-year growth rate of M2 multiplier  
ELEC – year-on-year growth in electricity consumption (proxies as output)  
SP – year-on-year growth in stock prices  
CONTAGION – dummy variable defined earlier  
WTDER – weighted average of month-on-month changes in the nominal exchange rates of Indonesia, Malaysia and Thailand

<b>Table 10</b> <b>Probit Results with unconstrained sample including exchange rate of competing countries</b>				
Dependent Variable: CRISIS				
Method: ML - Binary Probit				
Date: 05/28/02 Time: 11:39				
Sample(adjusted): 1987:09 2001:12				
Included observations: 172 after adjusting endpoints				
Convergence achieved after 8 iterations				
Covariance matrix computed using second derivatives				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.878252	0.642027	-4.483067	0.0000
STD_FXR(-2)	0.011359	0.009940	1.142777	0.2531
DC(-5)	0.056671	0.027191	2.084161	0.0371
DEFRATIO(-8)	18.49533	9.386452	1.970428	0.0488
M2M(-6)	0.063926	0.028839	2.216611	0.0266
ELEC(-4)	-0.231133	0.086760	-2.664058	0.0077
SP(-4)	-0.010650	0.007646	-1.392845	0.1637
CONTAGION	3.471384	0.806460	4.304473	0.0000
WTDER(-6)	0.071745	0.038965	1.841242	0.0656
Mean dependent var	0.069767	S.D. dependent var		0.255498
S.E. of regression	0.198784	Akaike info criterion		0.352509
Sum squared resid	6.440960	Schwarz criterion		0.517204
Log likelihood	-21.31578	Hannan-Quinn criter.		0.419330
Restr. log likelihood	-43.52236	Avg. log likelihood		-0.123929
LR statistic (8 df)	44.41316	McFadden R-squared		0.510234
Probability(LR stat)	4.75E-07	Durbin-Watson Stat		1.96
Obs with Dep=0	160	Total obs		172
Obs with Dep=1	12			
Variable Definitions:				
CRISIS – dummy variable which equals 1 during a pressure period				
STD_FXR – ratio of short-term foreign debt to foreign exchange reserves				
DC – year-on-year growth of domestic credit in real terms				
DEFRATIO – year-on-year change of national government deficit as a ratio to electricity sales				
M2M – year-on-year growth rate of M2 multiplier				
ELEC – year-on-year growth in electricity consumption (proxies as output)				
SP – year-on-year growth in stock prices				
CONTAGION – dummy variable defined earlier				
WTDER – weighted average of month-on-month changes in the nominal exchange rates of Indonesia, Malaysia and Thailand				

The results are basically the same as those reported in Tables 7 and 8. However, the variable STD\_FXR becomes insignificant in Table 10. One reason is that the correlation between STD\_FXR and WTDER is relatively high—the correlation coefficient of the two variables at the indicated lag structure is 0.19—in the relevant sample period.

The variable WTDER is significant with a six month lag, indicating that exchange rate movements of competing countries influence the peso. It should be noted that the

CONTAGION variable was retained in the specification of the last two equations. The latter is defined by actual currency crises while changes in WTDER, even sharp movements, need not necessarily lead to a crisis in the relevant countries. However, currency crises are almost always accompanied by large changes in the nominal exchange rate. But since CONTAGION includes countries aside from Indonesia, Malaysia and Thailand, there is no duplication between this variable and WTDER.

The next step is to determine which of the significant variables were flashing prior to the relevant crises. This is achieved with the help of the signals approach. A by-product of this analysis would be a comparison of the results of the two approaches.

#### *The Kaminsky-Reinhart Signals Approach*

The signals approach was re-applied using Philippine data from 1975-1996. Optimal thresholds reported by Goldstein, Kaminsky and Reinhart (2000) were adopted.<sup>6</sup> Tables 11a, 11b and 11c show the behavior of the indicators used in the study for three periods 1981-83, 1987-1990 and 1995-1997 while Table 11d shows the definitions of the variables. The results for 1997 are considered out-of-sample. It is during these three periods that the indicators are most active. Meanwhile, Table 12 identifies the specific indicators that were most active and the number of months wherein their values crossed the threshold during the 36-month window identified.

<p><b>Table 11d</b>  <b>Definitions of Indicators used in Updated Kaminsky-Reinhart Signals Approach</b>  (See tables 11a-11c)</p>
<p>RER – measure of currency overvaluation.  X – year-on-year growth rate of exports in nominal dollar terms.  M – year-on-year growth rate of imports in nominal dollar terms.  RIRD – real interest rate differential, foreign less domestic interest rate.  FXR – year-on-year growth rate of foreign exchange reserves.  M2M – year-on-year growth rate of M2 multiplier.  M2/RES – year-on-year growth rate of ratio of M2 to foreign exchange reserves.  DC- year-on-year growth rate of outstanding domestic credit in real terms.  M1 – excess demand for real M1 balances.  RIR – real interest rate.  L/D – year-on-year growth rate of loans-to-deposits ratio.  ELEC – year-on-year growth rate of electricity consumption (proxies as output).  DEF/ELEC – year-on-year change of ratio of national government deficit to electricity consumption.  SP – year-on-year growth rate of stock prices.  STD/FXR – year-on-year growth rate of the ratio of short-term external debt to foreign</p>

<sup>6</sup> Table 2.4, page 29. For indicators not included in the list of Goldstein, Kaminsky and Reinhart, the optimal threshold of the most similar indicator was used. The measures of excess M1 balances and degree of currency overvaluation follow Yap (2001) and are described in Table 4.

exchange reserves.  
TD/FXR – year-on-year growth rate of the ratio of total external debt to foreign exchange reserves.  
CONT – measure of contagion.  
IBD – year-on-year growth of interbank loans in real terms.  
S – Kaminsky-Reinhart S index.  
S-adj – S index adjusted for a factor related to number of available indicators in the particular month (factor = total number of possible indicators/number of available indicators)  
K – Kaminsky-Reinhart K index.  
K-adj – K index adjusted for a factor (factor = sum of noise-signal ratio of all possible indicators/sum of noise-signal ratio of available indicators)

<b>Table 12</b> <b>Most Active Indicators in Time Period Indicated</b> (Number in parentheses indicates number of times indicator crossed threshold)	
1981-83	FXR (20), M2/RES (18), M2M (11), CONTAGION (7), RER (4), SP (3)
1987-89	TD/FXR (17), STD/FXR (16), M2/RES (12), FXR (11), IBD (6)
1995-97	DC (30), L/D (12), M2M (11), SP (10), RER (7), IBD (5), CONTAGION (4)
2000-2001	SP (15), ELEC (10), X (8)

Generally the results are similar to those obtained by Yap (2001). There was more activity in terms of number of signals flashing in the 1983 crisis compared to the 1997 crisis. The maximum number of signals flashing simultaneously was only 4 in the 1997 crisis compared to 6 in the 1983 crisis and this has not even been adjusted for the number of available indicators. A more valid comparison is 4 in 1997 and 8.3 in 1983 (Table 11a). The earlier crisis conforms to a first generation BOP crisis wherein the depletion of reserves was consistently beyond its critical value. However, based on the probit results, what triggered the crisis would have been the high money multiplier and contagion. In the case of the 1997 crisis, excessive credit, a fall in stock prices and contagion triggered the crisis. The variables that are significant in the probit estimates are generally prominent in the crisis episodes, except for the deficit ratio and electricity consumption.

What is interesting, however, is the period of marked stress between November 1987 and October 1988 which did not culminate in any major crisis. Figure 1 shows that the estimated probability of a crisis—using the results of the equation in Table 9—was generally low between 1987 and 1989 except for the month April 1989. What would set apart this period from those wherein a major crisis occurred is the number of times the contagion variable deviated from zero. Between 1987 and 1989, only once did a country relevant to the Philippines experience a crisis and this occurred in April 1989.

These findings conform to earlier analysis of the causes of the 1997 crisis, which emphasized the role of contagion (Yap 2001). Foreign borrowing and high domestic credit made the economies vulnerable but not necessarily weak. What transformed the vulnerability to a weakness was contagion from the Thai crisis. The latter was triggered by a standard first generation sequence of events—an unsustainable current account deficit which led to a sharp depreciation of the baht. The sharp adjustment in the exchange rate transformed the vulnerability of the Thai banking system into an economic weakness. This led to the downward spiral in the Thai economy, subsequently dragging its neighbors into the quagmire.

### **VIII. Existing Imbalances and Sustainable Economic Growth**

The two empirical approaches can be used to assess the short- and medium-term prospects of the Philippine economy. Estimates of the probability of a crisis up to 2002.4 using the equation in Table 9 show a relatively small value indicating no major stress in the economy (Figure 2). The exception is December 2001 where a spike occurs because of the crisis in Argentina. However, contagion did not become relevant because foreign investors had already factored in the repercussions of the Argentine economic crisis since it had been imminent for an extended period of time.

Another reason for a more optimistic outlook is that the indicators that have consistently crossed their threshold between 2000.1 and the present have been exports—which is related to the cyclical downturn in the global electronics market—and stock prices, reflecting the higher risk aversion of foreign portfolio investors (Table 12). The downward trend in these two factors is expected to be reversed in 2002. Even the deficit ratio, which has received a lot of attention lately, has not reached its critical level.

A financial indicator that has not been included in the empirical tests but has been a source of great concern lately is the ratio of nonperforming loans of commercial banks. From a level of 12 percent in January 1999, the NPL ratio has reached 18.4 percent in February 2002. While this remains lower than that of economies harder hit by the 1997 crisis, the rising trend should be a signal of increasing corporate and financial distress. One solution being considered is an asset management company to be operated by a private group, with the participation of commercial banks.

What should be more critical to policy makers are persistent structural problems that constrain the rate of economic growth. As seen from the probit estimates, the proxy of economic growth significantly affects the probability of a crisis. We turn now to crucial factors that have affected medium-term economic growth.

One is infrastructure, which is considered by some analysts as the weakest link in the chain of Philippine economic development. Table 13 shows some indicators related to power generation for selected countries in East Asia. The Philippines has the highest transmission and distribution losses in percentage terms and this is one reason why it has

the second highest average rate, next only to Japan. The table also shows the number of telephone lines per 1,000 people.

<b>Table 13</b> <b>Indicators Related to Power Generation and Communications</b>			
	Percentage Transmission and Distribution losses, 1994	Average Rates (in peso per KWh), 1997	Telephone mainlines (per 1,000 people), 1999
Singapore	3.39	3.0076	482
Korea	5.26	2.7435	438
Japan	5.98	5.6451	568
Malaysia	8.88	3.1177	203
Thailand	9.65	1.6505	86
Indonesia	12.47	1.6505	29
Philippines	19.00	3.360	39
Source: Medium Term Development Plan 1998-2004 for data on power generation; UNDP 2001 Human Development Report for data on telephone mainlines			

The Philippines also compares poorly in terms of paved road ratio, which is the length of paved roads divided by the total length of roads (Table 14). However, in terms of road density the Philippines ranks higher than its Southeast Asian neighbors.

<b>Table 14</b> <b>Road Densities and Paved Road Ratios, 1997</b>		
	Road Density Km/square km	Paved Road Ratio
Philippines	0.63	0.20
Indonesia	0.19	0.47
Malaysia	0.20	0.74
Thailand	0.42	0.82
Viet Nam	0.46	0.35
Source: Medium Term Development Plan 1998-2004		

These infrastructure indicators indicate that the Philippines still has lot of catching up to do when compared to its East Asian neighbors.

Another critical factor where the Philippines is lagging is human resource development. Table 15 reports the indices of human development derived from the 2001 UNDP report. This includes the life expectancy at birth, population growth rate, the education index and the overall human development index. The Philippines fares well in terms of the education index but this is rather deceptive given the mediocre quality of her tertiary schools. The overall human development index is on a lower end of the spectrum

in this sample and one reason is the relatively high population growth rate. As of the last census in 2000, the population growth rate in the Philippines was 2.36 percent, very close to the average value in the previous 25 years.

<b>Table 15</b>				
<b>Human Development Indicators, 1999</b>				
	Life Expectancy at Birth	Population Growth Rate (1975-1999)	Education Index	Human Development Index
Singapore	77.4	2.3	0.87	0.876
Korea	74.7	1.1	0.95	0.875
Japan	80.8	0.5	0.93	0.928
Malaysia	72.2	2.4	0.80	0.774
Thailand	69.9	1.7	0.84	0.757
Indonesia	65.8	1.8	0.79	0.677
Philippines	69.0	2.4	0.91	0.749
Source: UNDP 2001 Human Development Report				

An outcome of inferior infrastructure development, a relatively poor record in human resource development, and erratic economic growth in the past three decades is a worrisome poverty situation. Based on official data, the rate of poverty incidence increased between 1997 and 2000 while the number of poor has actually increased between 1985 and 2000 (Figure 3)<sup>7</sup>. This is one indicator that reflects the inadequacy and perhaps even the failure of economic policy in the past three decades.

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<sup>7</sup> Figure 3 was obtained from Dr. Arsenio Balisacan of the University of the Philippines School of Economics. The basic data are derived from the Family Income and Expenditure Surveys of the Philippines, 1985-2000.



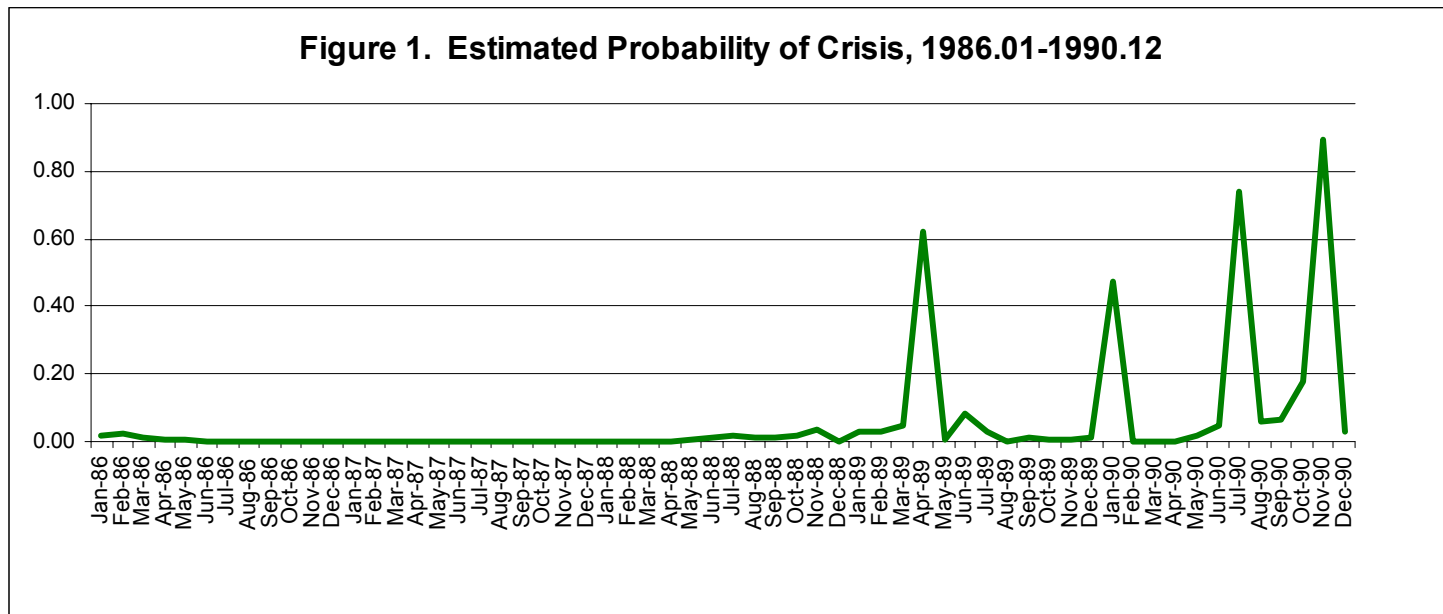
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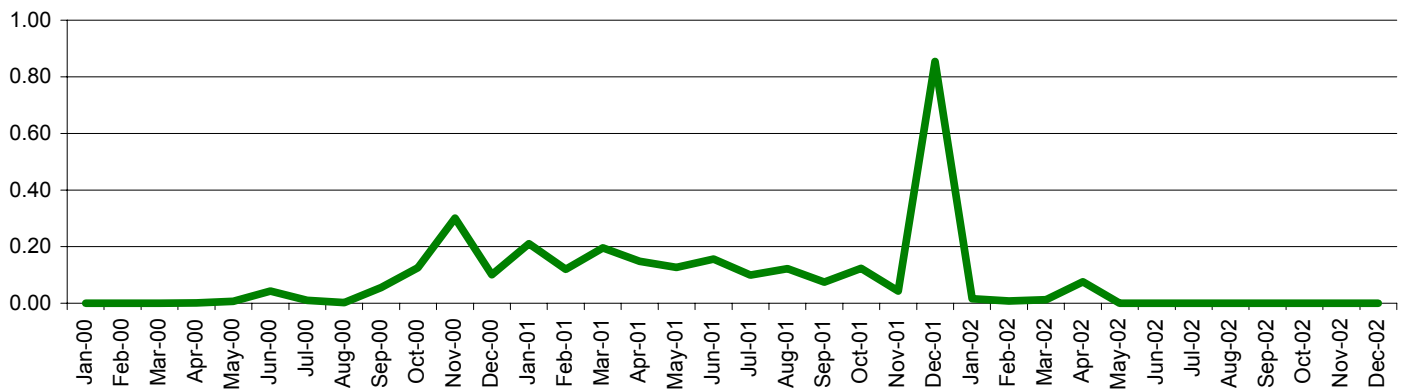
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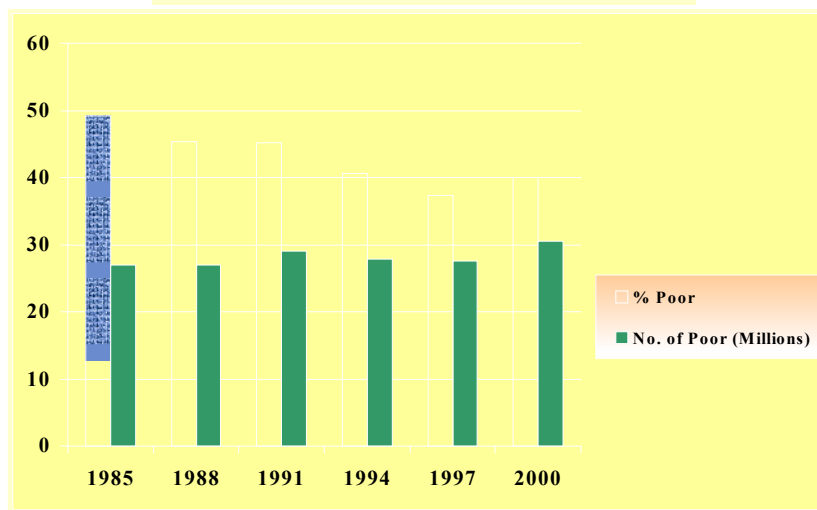
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**Figure 2. Estimated Probability of Crisis, 2000.01-2002.12**



**Figure 3  
Poverty in the Philippines**



**TABLE 11A**  
**TRANSFORMED INDICATORS FOR THE PHILIPPINES, 1970-1996 (in-sample), 1997-2001 (out-of-sample)**  
**Period 1981.01-1983.12**

	RER	X	M	R/RD	FXR	M2M	M2/RES	DC	M1	R/R	L/D	ELEC	DEF/ELEC	SP	STD/FXR	TD/FXR	CONT	IBD	S	S-adj	K	K-adj
threshold	1.0569	-11.9152	41.2131	8.9279	-38.7843	14.4382	74.6609	24.3759	1.0781	12.4083	11.9961	0.0657	0.0342	-21.2849	12.2871	15.9101	0.0000	97.9758				
noise/signal ratio	0.22	0.51	0.87	1.00	0.50	0.59	0.51	0.68	0.57	0.77	1.00	0.57	1.00	0.46	1.00	1.00	1.00	1.00				
1981 JAN	0	0	0	1	0	1	0	0	0	0	n/a	0	n/a	1	n/a	n/a	0	n/a	3	4.15	4.87	7.82
1981 FEB	0	0	0	1	0	1	0	0	0	0	n/a	0	n/a	1	n/a	n/a	1	n/a	4	5.54	5.87	9.43
1981 MAR	0	0	0	0	0	1	0	0	0	0	n/a	0	n/a	1	n/a	n/a	0	n/a	2	2.77	3.87	6.21
1981 APR	0	0	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	0	0.00	0.00	0.00
1981 MAY	0	0	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	0	0.00	0.00	0.00
1981 JUN	0	0	0	1	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	1	1.38	1.00	1.61
1981 JUL	0	0	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	1	n/a	1	1.38	1.00	1.61
1981 AUG	0	0	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	0	0.00	0.00	0.00
1981 SEP	0	1	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	1	1.38	1.96	3.15
1981 OCT	0	0	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	0	0.00	0.00	0.00
1981 NOV	0	1	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	1	1.38	1.96	3.15
1981 DEC	0	0	0	0	0	0	0	0	1	0	n/a	0	n/a	0	n/a	n/a	0	n/a	1	1.38	1.75	2.82
1982 JAN	0	1	0	0	1	0	1	0	0	0	n/a	0	n/a	1	n/a	n/a	0	n/a	4	5.54	8.10	13.00
1982 FEB	0	1	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	1	n/a	4	5.54	6.92	11.12
1982 MAR	0	1	0	0	0	0	0	0	0	0	n/a	0	n/a	1	n/a	n/a	0	n/a	2	2.77	4.13	6.64
1982 APR	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	1	n/a	n/a	0	n/a	3	4.15	6.13	9.85
1982 MAY	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	3.96	6.36
1982 JUN	0	1	0	0	0	0	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	1	1.38	1.96	3.15
1982 JUL	1	0	0	0	0	1	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	6.24	10.02
1982 AUG	1	1	0	0	1	1	1	0	0	0	n/a	0	n/a	0	n/a	n/a	1	n/a	6	8.31	13.16	21.14
1982 SEP	1	1	0	0	0	1	0	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	3	4.15	8.20	13.17
1982 OCT	1	0	0	0	1	1	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	4	5.54	10.20	16.38
1982 NOV	0	0	0	0	1	1	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	3	4.15	5.66	9.08
1982 DEC	0	0	0	0	1	1	1	0	0	0	n/a	0	n/a	0	n/a	n/a	1	n/a	4	5.54	6.66	10.69
1983 JAN	0	0	0	0	1	1	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	3	4.15	5.66	9.08
1983 FEB	0	1	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	1	n/a	4	5.54	6.92	11.12
1983 MAR	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	3.96	6.36
1983 APR	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	1	n/a	3	4.15	4.96	7.97
1983 MAY	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	3.96	6.36
1983 JUN	0	0	0	0	1	1	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	3	4.15	5.66	9.08
1983 JUL	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	3.96	6.36
1983 AUG	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	3.96	6.36
1983 SEP	0	0	0	0	1	0	1	0	0	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	3.96	6.36
1983 OCT	0	0	0	0	1	0	1	0	1	0	n/a	0	n/a	0	n/a	n/a	0	n/a	3	4.15	5.72	9.18
1983 NOV	0	0	0	0	1	0	0	0	1	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	3.75	6.03
1983 DEC	0	0	0	1	0	0	0	0	1	0	n/a	0	n/a	0	n/a	n/a	0	n/a	2	2.77	2.75	4.42

**TABLE 11B**  
**TRANSFORMED INDICATORS FOR THE PHILIPPINES, 1970-1996 (in-sample), 1997-2001 (out-of-sample)**  
**Period 1987.01-1989.12**

	RER	X	M	RIRD	FXR	M2M	M2/RES	DC	M1	RIR	L/D	ELEC	DEF/ELEC	SP	STD/FXR	TD/FXR	CONT	IBD	S	S-adj	K	K-adj
threshold	1.0569	-11.9152	41.2131	8.9279	-38.7843	14.4382	74.6609	24.3759	1.0781	12.4083	11.9961	0.0657	0.0342	-21.2849	12.2871	15.9101	#REF!	97.9758				
noise/signal ratio	0.22	0.51	0.87	1.00	0.50	0.59	0.51	0.68	0.57	0.77	1.00	0.57	1.00	0.46	1.00	1.00	1.00	1.00				
1987 JAN	0	0	0	0	0	0	0	0	0	1	n/a	0	0	0	0	0	0	0	1	1.06	1.30	1.40
1987 FEB	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0.00	0.00	0.00
1987 MAR	0	0	0	0	0	0	0	0	0	1	n/a	0	0	0	0	0	0	0	1	1.06	1.30	1.40
1987 APR	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0.00	0.00	0.00
1987 MAY	0	0	0	0	0	0	0	0	0	0	n/a	0	1	0	0	0	0	0	1	1.06	1.00	1.08
1987 JUN	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0.00	0.00	0.00
1987 JUL	0	0	1	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	1	1.06	1.15	1.24
1987 AUG	0	0	1	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	1	1.06	1.15	1.24
1987 SEP	0	0	1	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	1	1.06	1.15	1.24
1987 OCT	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	1	0	0	1	1.06	1.00	1.08
1987 NOV	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	1	0	0	1	1.06	1.00	1.08
1987 DEC	0	0	1	0	1	0	1	0	1	0	0	0	0	0	1	1	0	0	6	6.00	8.86	8.86
1988 JAN	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1	1	0	0	5	5.00	7.72	7.72
1988 FEB	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	4	4.00	5.96	5.96
1988 MAR	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1	1	0	0	5	5.00	7.72	7.72
1988 APR	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	4	4.00	5.96	5.96
1988 MAY	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	5	5.00	6.96	6.96
1988 JUN	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	1	0	1	6	6.00	7.96	7.96
1988 JUL	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	1	0	1	6	6.00	9.13	9.13
1988 AUG	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	4	4.00	5.96	5.96
1988 SEP	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	4	4.00	5.96	5.96
1988 OCT	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	5	5.00	6.96	6.96
1988 NOV	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	3	3.00	3.75	3.75
1988 DEC	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	3	3.00	3.75	3.75
1989 JAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
1989 FEB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.00	1.00	1.00
1989 MAR	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	2.00	2.90	2.90
1989 APR	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	5	5.00	6.11	6.11
1989 MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2.00	2.00	2.00
1989 JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2.00	2.00	2.00
1989 JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1.00	1.00	1.00
1989 AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
1989 SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
1989 OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
1989 NOV	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	2.00	5.55	5.55
1989 DEC	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	2.00	6.30	6.30

TABLE 11C  
TRANSFORMED INDICATORS FOR THE PHILIPPINES, 1970-1996 (in-sample), 1997-2001 (out-of-sample)  
Period 1995.01-1997.12

	RER	X	M	RIRD	FXR	M2M	M2/RES	DC	M1	RIR	L/D	ELEC	DEF/ELEC	SP	STD/FXR	TD/FXR	CONT	IBD	S	S-adj	K	K-adj
threshold	1.0569	-11.9152	41.2131	8.9279	-38.7843	14.4382	74.6609	24.3759	1.0781	12.4083	11.9961	0.0657	0.0342	-21.2849	12.2871	15.9101	#REF!	97.9758				
noise/signal ratio	0.22	0.51	0.87	1.00	0.50	0.59	0.51	0.68	0.57	0.77	1.00	0.57	1.00	0.46	1.00	1.00	1.00	1.00				
1995 JAN	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	2.00	3.17	3.17
1995 FEB	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	2.00	3.17	3.17
1995 MAR	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	3	3.00	4.17	4.17
1995 APR	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	3	3.00	4.17	4.17
1995 MAY	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	2.00	3.17	3.17
1995 JUN	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	3	3.00	4.17	4.17
1995 JUL	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	3	3.00	4.17	4.17
1995 AUG	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1.00	1.47	1.47
1995 SEP	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1.00	1.47	1.47
1995 OCT	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	3	3.00	5.34	5.34
1995 NOV	0	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	4	4.00	6.34	6.34
1995 DEC	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	2.00	3.22	3.22
1996 JAN	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	2.00	3.17	3.17
1996 FEB	0	0	1	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	4	4.00	4.62	4.62
1996 MAR	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2.00	2.47	2.47
1996 APR	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2.00	2.47	2.47
1996 MAY	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2.00	2.47	2.47
1996 JUN	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2.00	2.47	2.47
1996 JUL	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2.00	2.47	2.47
1996 AUG	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2.00	2.47	2.47
1996 SEP	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	3	3.00	4.64	4.64
1996 OCT	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	3	3.00	4.64	4.64
1996 NOV	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2.00	2.47	2.47
1996 DEC	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	4	4.00	8.77	8.77
1997 JAN	1	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	4	4.00	9.19	9.19
1997 FEB	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2.00	6.02	6.02
1997 MAR	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2.00	6.02	6.02
1997 APR	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	3	3.00	8.19	8.19
1997 MAY	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	2.00	6.72	6.72
1997 JUN	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	2.00	6.72	6.72
1997 JUL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	4	4.00	4.69	4.69
1997 AUG	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	1	0	5	5.00	5.77	5.77
1997 SEP	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	3	3.00	3.47	3.47
1997 OCT	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	5	5.00	5.30	5.30
1997 NOV	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	4	4.00	5.47	5.47
1997 DEC	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	0	0	5	5.00	7.23	7.23