

# **Recovery from Currency Crises**

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## **Abstract**

This paper studies the recovery process after currency crises in 105 developing countries between 1975 and 1996. It examines which factors help us explain output growth after the crisis based on a fixed effects panel regression model. We find openness, investment before crisis, US interest rate, G7 country growth rate, exports, fiscal policy, and political stability are important factors for the recovery. Short-term debt, banking crisis, and monetary policy are significant in some estimation, but not as robust as the other variables. The estimation results are used to explain the recovery process in recent Asian crisis.

## **1. Introduction**

Two important questions about the currency crisis are why it occurs and how to recover from it. A lot of studies have been done for the former question, but relatively little has been done for the latter question. The purpose of this paper is to examine the factors in the recovery from the currency crisis and to understand the Asian recovery from the severe crisis in 1997-98.

A contribution of this paper is to perform an empirical analysis that is not subject to endogeneity problem. I use one period ahead policy variables and estimate the three-year panel data with a fixed effects regression model. From the regression analysis, we find several important factors in the recovery from the currency crisis, such as openness, investment boom before crisis, foreign interest rate and foreign growth, fiscal policy, and political stability. To the best of my knowledge, this paper is the first one that considered political stability in an empirical analysis for the recovery from the currency crisis.

The rest of the paper is organized as follows. After literature review in section 2, we will consider theoretical aspects in section 3. In section 4, we define currency crisis and discuss measures of recovery and the data set. A panel regression is followed in section 5, and we examine the Asian recovery with the regression results in section 6. Conclusion is in section 7.

## **2. A Review of the Literature**

Several empirical papers report the factors that seem to be important in recovery from currency crises. The factors suggested in the papers are openness, exports, real exchange rate, fiscal and monetary policies.

### 1) Openness, exports, and real exchange rate

Openness, exports, and real exchange rate are closely related variables. Real exchange rate depreciation is positively related to exports growth. Exports can grow more if the economy is more open to international trade. In a recession period when domestic demand is not sufficient, foreign demand could be an important source for recovery. That is why openness, exports, and real exchange rate could be crucial factors in the recovery process.

Milesi-Ferretti and Razin (2000), who studied currency crises of 105 developing countries between 1970 and 1996, found openness of the economy (measured by the share of exports and imports in GDP) was an important factor of output performance in the recovery. Dornbusch and Werner (1994) and Dornbusch et al. (1995) examined currency crises in Latin America and Europe, and argued overvaluation of real exchange rate was the main reason for slow recovery in many of Latin American countries in the 1980s. Similar results were found in Park and Lee (2001). Park and Lee used a cross-

country data of 96 countries from 1970 to 1995, and found that depreciation of real exchange rate and favorable global economic environments are critical for the speedy recovery after the crises. According to Sachs (1985), who compared economic performance in Latin America and East Asia in the early 1980s, suggested that slow recovery in Latin American countries in the 1980s is partly due to import-substitution structure of the economies while East Asian countries grew fast because of export-oriented economic structures.

## 2) Fiscal and monetary policies

Expansionary fiscal and monetary policies are typical policy recommendations for an economy in recession. However, when the recession is caused by a currency crisis, it is not that simple. Initial policy recommendations from IMF for the Asian crisis countries were tight macroeconomic policies to stabilize the currency markets. Some economists such as Cho and West (2000) and Boorman et al. (2000) report that the tight monetary policy recommended by IMF did work in stabilizing the financial markets in Asia. Cho and West examined Korean currency market and found that the high interest rate was effective in stabilizing the exchange rate. According to Boorman et al., the loss of monetary control in Indonesia in late 1997 and early 1998 caused a depreciation-inflation spiral, while Korea and Thailand could avoid it with tight monetary policies.

However, others such as Radelet and Sachs (1998) argue that the initial tight policy recommended by IMF did not work for the stabilization of the currency markets in Asia, and did harm to the economic recovery of the Asian countries. Mishkin (1996) suggests that monetary policy response to the financial crisis should be different between industrial and developing countries. According to him, an expansionary monetary policy promotes economic recovery in industrial countries, but it may have the opposite effect to the recovery of developing countries due to higher depreciation, higher inflation, and deterioration in balance sheets.

In a cross-country data, Park and Lee found expansionary fiscal policy is positively related to the fast recovery. With a simple Mondell-Fleming model augmented with the balance sheet effect, Krugman (1999b) recommended fiscal expansion and tight monetary policy as a proper policy mix in the currency crisis.

Although there are several empirical studies on the recovery from currency crisis, more works need to be done. What makes difficult in econometric analysis for the role of fiscal and monetary policies in post-crisis recovery is the endogeneity between policy variables and recovery measures. Milesi-Ferretti and Razin (2000) used only the variables before the crisis as independent variables in the regression, that is, no policy variables were included in the regression. Park and Lee (2001) and Hong and Tornell (2000) are subject to the endogeneity problem.

### 3. Theoretical Consideration

In this section, we will discuss contractional effect of currency crisis and the ways to recover from recession following the currency crisis in a theoretical aspect.

Devaluation itself does not have to be contractional. On the contrary, it is generally thought that devaluation increases net exports if the Marshall-Lerner condition holds, and increasing exports lead output growth. However, this is not always the case even though the Marshall-Lerner condition meets. We will see the situation with a version of Mundell-Fleming model similar to Krugman (1999b).<sup>1</sup> This is a model of small open economy with a perfectly elastic aggregate supply curve (price is assumed constant) and imperfect capital mobility (domestic and foreign interest rates can be different).

$$(1) Y = C(Y) + I(i, i^*, eP^*/P, Y) + G + T(eP^*/P, Y, Y^*), \quad C_Y > 0, I_i < 0, I_{i^*} < 0, I_e < 0, I_Y > 0, T_e > 0, T_Y < 0, T_{Y^*} > 0$$

$$(2) M/P = L(Y, i), \quad L_Y > 0, L_i < 0$$

$$(3) B = T(eP^*/P, Y, Y^*) + K(i, i^*, eP^*/P), \quad K_e < 0, K_i > 0, K_{i^*} < 0$$

$Y(Y^*)$ : domestic (foreign) real output

C: consumption

I: investment

$i(i^*)$ : domestic (foreign) interest rate

e: nominal exchange rate

$P(P^*)$ : the price of domestic (foreign) output

G: government spending

T: net exports

M: money supply

L: real money demand

B: balance of payments

K: capital account

Equilibrium in the goods market is given by (1). Domestic real output is the sum of consumption, investment, government spending, and net exports. The real exchange rate ( $eP^*/P$ ) in investment indicates the balance sheet effect.<sup>2</sup> Suppose that many firms are highly leveraged, that a large part of their debt is denominated in foreign currency, and that under some circumstances their investment is constrained by their balance sheets. Then the domestic demand directly depends on the real exchange rate as in (1). When prices are assumed constant in the short run, a large nominal devaluation could cause a drop in domestic demand. This happens because of a large drop in investment after a devaluation even though there is an increase in net exports.

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<sup>1</sup> In Krugman (1999b), perfect capital mobility is assumed, so the equation  $i=i^*$  replaces equation (3) in our model.

<sup>2</sup> The balance sheet effect in financial crisis is originally modeled by Bernanke and Gertler (1989).

(2) is the typical money market equilibrium condition. (3) is the balance of payments equation. It is the sum of net exports and capital account. Again, the real exchange rate in  $K$  indicates the balance sheet effect. Devaluation in real exchange rate increases net exports, but decreases capital account balance. If the balance sheet effect is very large, devaluation may lead to deterioration in the balance of payments. To make the model simple, I assume that all of the capital inflow goes to investment, although some portion of investment is financed from domestic fund. Any net capital outflow implies a reduction in investment by the same amount.

The economy can be described with graphs as in Figure 1-4. IS indicates the goods market equilibrium, LM is for the money market equilibrium, and BP connects the points where the balance of payments are zero. The BP curve indicates the foreign exchange market equilibrium. The BP is horizontal in perfect capital mobility and vertical in no capital mobility. The upward sloping BP curve indicates that the capital is less than perfectly mobile. The BP is drawn flatter than the LM curve implying that, even with imperfect mobility, capital flows are more elastic than money demand to the rate of interest.

In Figure 1, the economy is in equilibrium at point A with a fixed exchange rate. Figure 2 is a situation after a shock. The shock can be either IS (leftward), LM (rightward), or BP (upward) shock. The economy is at point B where the balance of payments is in deficit. When the pressure from the balance of payments is big enough, the exchange rate is devalued. The devaluation will shift IS and BP curves. The direction of the shift is crucial. With no or insignificant balance sheet effect as shown in Figure 3, both IS and BP curves move rightward ( $IS'$  and  $BP'$ ), and the economy will be in equilibrium again at C. Devaluation results in more output and higher interest rate.

If there is a significant balance sheet effect, the IS curve shifts leftward ( $IS''$ ) and the BP curve shifts upward ( $BP''$ ) following a devaluation as in Figure 4. The upward shift of the BP curve is unambiguous from the assumption that all of the capital account in (3) goes to investment in (1). Thus, if IS moves leftward, BP moves leftward (upward), too. After the devaluation, the economy is at point D where  $IS''$  and LM meet. At point D, the balance of payments pressure toward devaluation is still there, and further devaluation only results in more output loss. If this is the case, a proper policy appears to be a tight monetary policy that moves the LM curve left until the equilibrium point E. Output at E is lower than D, but it prevents further turmoil in the foreign exchange market and prevents further loss in output.

When we define currency crisis as a sudden and large devaluation (or depreciation), both Figure 3 and 4 situations are possible. When the balance sheet effect is not significant (Figure 3), recovery from the crisis might be relatively easy. Devaluation itself could be a proper cure for the economic situation. However, if the balance sheet effect is significantly large and devaluation itself makes the situation worse (Figure 4), output loss may be large and the recovery would be difficult and take a long time.

Figure 1. Initial Equilibrium

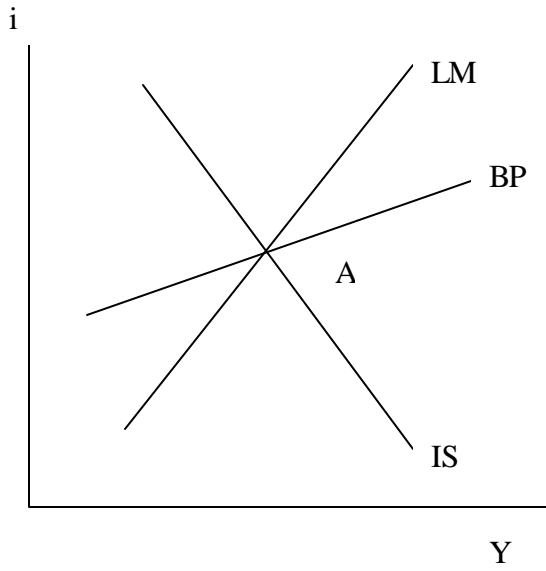


Figure 2. After a Shock

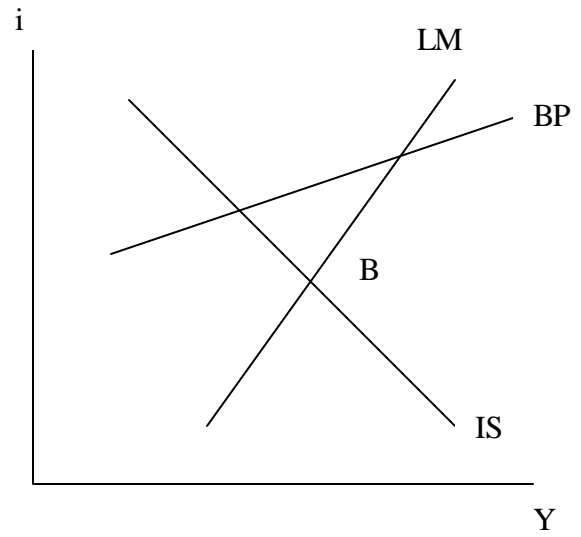


Figure 3. Expansionary Devaluation

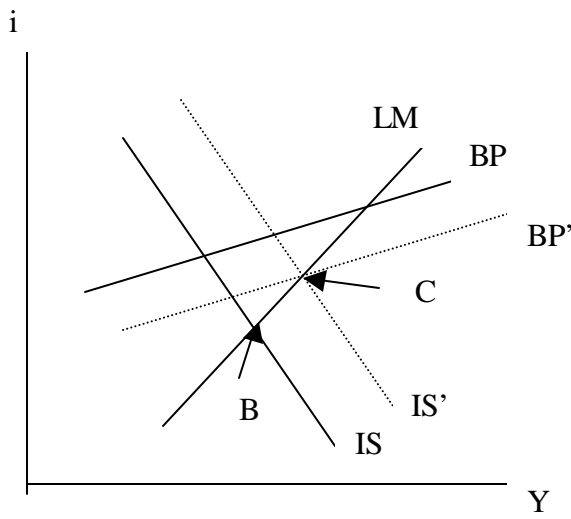
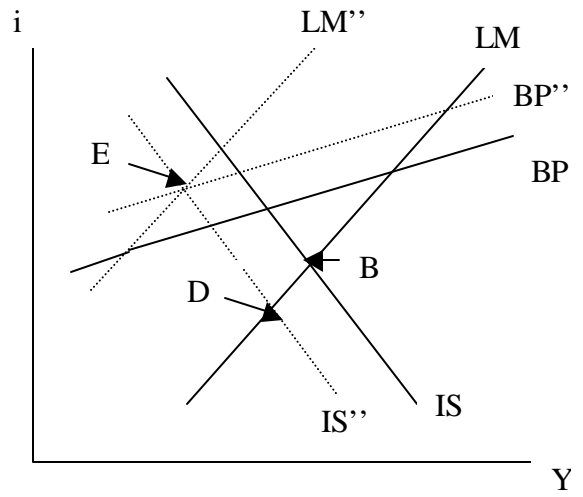


Figure 4. Contractionary Devaluation



The contractionary devaluation can be explained more clearly with one more equation suggested by Krugman (1999a). Equation (4) implies the restriction on investment financing. In normal periods, (4) is not binding. Investment is determined by interest rates and output, and the left hand side of (4) is less than the right hand side. In the currency crisis, however, (4) becomes a binding restriction with a large increase in the exchange rate and lowered wealth. This is the balance sheet effect suggested by Krugman (1999a,b). Moreover, it could be worse if  $\lambda$  falls in the currency crisis. Krugman's balance sheet effect is mainly about the increase in  $e$  and drop in both  $I$  and  $Y$ , but if we consider that the  $\lambda$  factor can fall suddenly because of new information on the fundamentals of the economy or nonfundamentals such as investors' panic or herding behavior, this simple framework can explain a variety of aspects in the currency crisis.

$$(4) I \leq (1+\lambda)W = (1+\lambda)(\alpha Y - D - eF)$$

W: wealth of the firm

D: domestic debt

F: foreign debt

Recovery from a currency crisis should start with a stop or a significant reduction in devaluation. A moderate devaluation might be expansionary, but a large devaluation generally reflects or causes problems in the economy. Once a currency crisis occurs, it is important to restore stability in the foreign exchange market. One way to achieve that is a tight monetary policy that results the economy at D in Figure 4. There is an initial output loss but it prevents further turmoil in the economy. When the financial market is stabilized, then monetary policy can be loose to reduce interest rates and increase domestic demand as suggested by the typical Keynesian economists.

While initial monetary policy may need to be tight, fiscal policy ( $G$  in equation (1)) can be expansionary from the beginning. An expansionary fiscal policy will bring the IS curve back to the right and increase aggregate demand in the economy. However, even the fiscal policy is not that simple. If the source of the currency crisis is from the fiscal sector, for example, large budget deficit and overly expansionary fiscal policy, more expansionary fiscal policy may destabilize the financial market further. Financial market will expect more devaluation when the fiscal balance is further deteriorated, and the recession will be deepened. Thus, initial fiscal stance should be important for the fiscal policy after the crisis.

Foreign demand ( $T$  in equation (1)) is an important factor to recover the economy when domestic demand is limited by the currency crisis. Exports growth is likely followed by a large devaluation from the crisis and also needed to balance the foreign exchange market in equation (3). The more open an economy is, the more it can export. Exports growth depends on foreign income ( $Y^*$ ) as well as real exchange rate ( $eP^*/P$ ), thus when world economy is growing at high rate, the recovery can be faster.

The parameter  $\lambda$  in (4) can represent many factors not explicit in the model. One factor is political stability. If the country becomes politically unstable,  $\lambda$  would drop and

investment may be limited by (4). In many developing countries, political factors play a significant role in the progress of the economy.

#### **4. Definition of Currency Crisis and Recovery, and the Data Set**

##### **1) Currency Crisis**

Eichengreen et al. (1994) first determined the timing of currency crises by using an indicator of exchange market pressure as a weighted average of the changes in exchange rate, foreign reserves, and interest rates for the data set of European countries. For developing countries where reliable market interest rates with long histories are not available, some economists used exchange rates and foreign reserves to calculate market pressure indicators and to date the currency crises. (For example, Kaminsky and Reinhart (1999) and Aziz et al. (2000)) The reason to use either interest rates or foreign reserves in calculating the market pressure index is to identify successful defenses against speculative attacks in the foreign exchange market. However, reserve movements are extremely noisy measures of exchange market intervention for almost all countries. Because of this reason and also to increase the size of data set, we use only exchange rates to define a currency crisis as in Frankel and Rose (1996, henceforth F-R), Milesi-Ferretti and Razin (2000, M-R), and Park and Lee (2001).

Our definition of the currency crisis is similar to F-R and M-R. A currency crisis requires an exchange rate depreciation vis-à-vis the US dollar (or the French franc or the German mark<sup>3</sup>) of 20 percent, at least a doubling in the rate of depreciation with respect to the previous year. F-R and M-R used 25 percent criterion, but we use 20 percent to include the Thai bath in 1997 in the group of the currency crisis. The Thai bath depreciated 23.8 percent in 1997. The doubling depreciation criterion is used to avoid capturing the large exchange rate fluctuations associated with high-inflation countries. We use a window of plus/minus two years to identify independent crises.

##### **2) Recovery Measure**

There are two ways to measure recovery from the currency crisis in the literature. One is a variant of GDP growth rate and the other one is the number of time period to return to the trend growth rate.

Park and Lee (2001) used the average per capita GDP growth rates after 1 to 5 years from the crisis. In M-R, recovery is measured by average GDP growth rate in three years following the crisis as a deviation from OECD average growth rate during the same period. Hong and Tornell (2000) used both GDP growth rates and deviation of GDP growth rates from its own historical average. As an alternative method, Aziz et al. (2000) and Bordo et al. (2001) measured recovery with the number of years before GDP growth returns to the trend growth rate.

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<sup>3</sup> The French franc for the CFA franc zone countries, and the German mark for European countries.

We use GDP growth rate as a deviation from its own historical average as in Hong and Tornell. The recovery years are three years beginning from the year after the crisis. Since we need growth rate for each three year in our panel estimation, the second measure of recovery (the numbers of years returning to the trend) is not used in this paper. We consider the historical average as the trend growth rate. In the estimation, we also consider alternative methods for output trend such as the trend growth rate from Hodrick-Prescott filtering.

### 3) Data Set

The data set consists of 105 developing countries, the same countries in M-F.<sup>4</sup> (a complete list of countries in Appendix 1) The main source of this annual data is the World Development Indicator from the World Bank. (Appendix 2 describes data definitions and sources.) For the purpose of the empirical analysis in the next section, I use currency crisis episodes between 1975 and 1996. From our definition of the currency crisis, we find 154 independent currency crises (out of total 219 crises) in 86 countries. The data set in the regression does not include the Asian crisis, so we use the regression results to predict the recovery in the Asian crisis.

## 5. Regression Analysis

Our Regression model is a fixed effects model (also called the least squares with dummy variables model). With this panel estimation, we can avoid endogeneity problem of policy variables in the regression.

$$y_{it} = \alpha_t + \beta x_i + \gamma z_{it} + \delta p_{it-1} + u_{it}, \quad i=1,2,\dots, N, t=1,2,3$$

y: GDP growth deviation from the average

$\alpha_t$ : time period dummy (t+1, t+2, t+3)

x: variables before the crisis

$z_t$ : exogenous variables such as exports, US interest rates, etc.

$p_{t-1}$ : predetermined policy variables such as fiscal and monetary variables.

u: error term

N: total number of currency crisis

Table 1 shows the regression results. Some conditions before the crisis appear to be important. Openness of the economy is a significant factor for the speedy recovery, which confirms the finding in M-R. High investment has negative effect on the recovery. Pre-crisis investment boom seems to cause deeper recession in the case of the currency crisis. This negative relation was also found in Hong and Tornell (2000). Short term debt to GDP ratio seems to have some negative effect on the recovery. Other precondition variables such as budget deficit and current account were not significant in the regression.

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<sup>4</sup> I am grateful for Milesi-Ferretti for sharing his dataset. I updated his dataset and added some more variables.

We found external factors are important in the recovery. World interest rates represented by US federal funds rate and global economic growth represented by GDP growth rate of G7 countries are significant in the regression. Exports are also significant. When the economy is in distress and domestic demand is limited in the developing countries, foreign demand has always been an important source of the recovery. This is the same in the recovery from the currency crisis. Favorable economic growth in industrialized countries and increased imports demand from those countries contribute fast economic recovery. Since currency crises are generally accompanied by a large foreign debt problem, low international interest rates should help the high debt countries.

As we examined in the theoretical section, the monetary policy in currency crises is a very delicate situation because expansionary policy is needed for the recovery, but at the same time, it might aggravate the loss of confidence in the market and cause more turmoil in the financial market. This negative impact of money growth is observed in the regression result. Nominal money growth results in a slow recovery. However, fiscal policy seems to be effective. Expansionary fiscal policy measured by the change in the fiscal balance to GDP ratio is significant in output recovery. We also find that banking crisis make the recovery slow and political factors also play important roles in the recovery process. This seems to be especially true for many developing countries where financial markets are underdeveloped and their political systems are not stable.

Appendix 3 shows the regression results when trend growth rate is derived from H-P filtering. Results largely remain unchanged, but some variables such as short-term debt, nominal M2 growth, and banking crisis become statistically insignificant.

Table 1. Regression results

Dependent variable: Real GDP growth rate deviation from trend

Variables	Coefficients (t-statistics)		
Openness ( $t_c-3$ to $t_c-1$ )	0.0289 ** (2.290)	0.0333 ** (2.929)	0.0247 ** (2.883)
Investment/GDP ( $t_c-3$ to $t_c-1$ )	-0.1047 ** (-2.397)	-0.0940 ** (-2.241)	-0.1041 ** (-3.260)
Fiscal balance/GDP ( $t_c-3$ to $t_c-1$ )	0.0028 (0.068)		
Current account/GDP ( $t_c-3$ to $t_c-1$ )	-0.0557 (-0.737)		
Total debt/GDP ( $t_c-1$ )	0.0037 (0.345)		
Short-term debt/GDP ( $t_c-1$ )	-0.0500 (-1.353)	-0.0388 (-1.540)	-0.0251 ** (-2.331)
US interest rate (t)	-0.2230 * (-1.752)	-0.2415 ** (-2.150)	-0.2160 ** (-2.101)
G7 growth (t)	0.3499 (1.466)	0.4460 * (1.942)	0.2518 (1.234)
Exports (t)	0.1180 ** (5.514)	0.0855 ** (3.615)	0.0845 ** (4.091)
Real M2 growth (t-1)	0.0020 (0.893)		0.0020 (0.866)
Nominal M2 growth (t-1)			-0.0004 ** (-3.187)
Change in fiscal balance/GDP (t-1 relative to [ $t_c-3$ to $t_c-1$ ])	-0.0792 * (-1.852)	-0.0661 ** (-2.109)	
Political failure (t)	-1.4119 ** (-2.533)	-1.4128 ** (-3.053)	-1.5655 ** (-4.091)
Banking crisis (t-1 or t)	-0.8337 (-1.212)	-1.1432 * (-1.733)	-1.0706 * (-1.942)
Dummy for $t_c+1$	-2.1689 ** (-3.355)	-2.5018 ** (-3.815)	-1.2871 ** (-2.236)
Dummy for $t_c+2$	-0.7519 (-1.231)	-0.9983 * (-1.663)	-0.6632 (-1.213)
Dummy for $t_c+3$ (constant in the regression)	0.5874 (0.353)	1.0759 (0.907)	1.5068 (1.355)
R-squared	0.3134	0.2636	0.2218
Number of observations	217	229	306

 $t_c$  : year of currency crisis $t_c-3$  to  $t_c-1$  : average for the three year period before currency crisis

\*\* : significant at 5 percent, \* : significant at 10 percent

Fixed effects model panel estimation with White's correction for heteroscedasticity.

## 6. Recovery in Asia

In this section, we derive predicted growth rates and examine the contribution of each factor to the recovery based on the regression model estimated in the previous section. Because the previous regression did not include the Asian crisis, this section is out-of-sample prediction. We use the second regression equation in the Table 1. From the definition in section 4, Thailand and Indonesia were in the crisis in 1997 and Korea, Malaysia, and Philippines in 1998. The prediction reported in Table 2 does not fit for the large fluctuations in the growth rates of individual years, but for the three year average the prediction fits well the actual growth. It correctly predicts the worst output performance in Indonesia and the slow recovery in Thailand. The model predicts relatively fast recovery in other three countries.

Table2. Actual GDP growth rate vs. Predicted GDP growth rate for the 5 Asian countries (Deviation from trend, %)

	Indonesia		Korea		Malaysia		Philippines		Thailand	
	act	pre	act	pre	act	pre	act	pre	act	pre
$t_c+1$	-19.24	-8.68	3.12	-3.82	-1.09	-1.65	-0.38	-4.88	-17.46	-6.11
$t_c+2$	-5.34	-7.97	1.02	-2.23	1.11	0.90	0.22	-1.27	-2.46	-4.41
$t_c+3$	-1.34	-8.37	-5.28	-0.59	-6.19	2.79	-1.28	1.51	-2.26	-2.13
mean	<b>-8.64</b>	<b>-8.34</b>	<b>-0.38</b>	<b>-2.21</b>	<b>-2.06</b>	<b>0.68</b>	<b>-0.48</b>	<b>-1.55</b>	<b>-7.39</b>	<b>-4.22</b>

act: actual, pre: predicted

$t_c$  : crisis year

Table 3 shows the contribution of each factor to the recovery. All countries benefited from openness of the economy, especially Malaysia at 6.21 percent. High investments which have been a foundation of fast growth in the region became a burden in the recovery. High short-term debt lowered the growth about a half percent while it is about one percent in Thailand. The sum of US interest rate and G7 growth rate has minimal effect on the recovery. The role of exports in recovery is the highest in Korea and lowest in Indonesia. In all countries, fiscal policy had positive effect to the recovery. Fiscal stance of the five countries before the crisis was good, so the countries could adopt expansionary fiscal policies without any serious problem. The unstable political situation in Indonesia after the crisis was a major obstacle for the recovery in that country. It hurt the growth more than 4.71 percent each year on average. Banking crises in all five countries make the recovery slow by 1.14 percent each year.

From Table 3, we see that most of the countries benefit from openness and exports. Malaysia is the most and Indonesia is the least in this aspect. A large drop in investment after the crisis has been the major hit to the all five countries. Investment boom makes the recovery slow, but it does not mean that high investment is bad for the economy. What matters here is excessive investment, although it is very difficult to define how much is excessive. Our focus in this paper is the short-run recovery from the currency crisis. Economists generally consider high investment has a beneficial effect on the long run

growth of the economy. Weak banking sector is the second major problem of the five countries in the recovering period. Political instability is the most serious obstacle in the Indonesian recovery. According to our analysis, the role of macroeconomic policy is relatively small in the Asian recovery. We may need higher frequency data with different econometric methodology to study the role of macro policy. At least what we know from this study is that other factors such as openness, exports, pre-crisis investment boom, political and financial market stability play major roles in the recovery from the currency crisis.

Table 3. Contribution to the recovery (GDP growth deviation from trend)  
(Three year average, %)

	Indonesia	Korea	Malaysia	Philippines	Thailand
Openness	1.75	2.17	6.21	3.09	1.51
Investment/GDP	-2.68	-3.40	-4.05	-2.19	-3.83
Short-term debt/ GDP	-0.55	-0.44	-0.58	-0.55	-0.91
US interest rate + G7 growth	-0.02	-0.10	-0.10	-0.10	-0.02
Exports	-0.36	1.47	0.87	0.01	0.70
Fiscal policy	0.20	0.13	0.37	0.24	0.30
Political failure	-4.71	0.00	0.00	0.00	0.00
Banking crisis dummy	-1.14	-1.14	-1.14	-1.14	-1.14
	-0.81	-0.81	-0.81	-0.81	-0.81
<b>Total</b>	<b>-8.32</b>	<b>-2.12</b>	<b>0.77</b>	<b>-1.45</b>	<b>-4.20</b>

## 7. Conclusion

In the last decade, economists' knowledge on currency crisis has expanded rapidly, but still the currency crisis occurred as a surprise and probably will be the same in the future. There seems to be a large gray area where a currency crisis can occur with some (typically small) probability. An article in The Wall Street Journal on October 27, 1997 was titled "South Korean Won is mostly unscathed, providing clues for staving off a crisis". According to the article, Korea had managed to avoid the currency crisis when Southeast Asian countries were in currency meltdown, and the reasons were a floating currency, managed depreciation, and heavy regulation. On November 21st, Korean government asked a rescue package from the IMF, and the most devastating currency crisis in Korean history was followed in December and January next year. If a currency crisis is inevitable or hard to predict, the next step is how to help an economy recover fast once a crisis occurs.

In this paper, we found several factors that are significant in the recovery after a currency crisis. Openness, G7 country output performance, low US interest rates, exports, and expansionary fiscal policy have positive effects on the recovery. Pre-crisis investment boom and political instability cause negative impact on the recovery process. Short-term foreign debt, expansionary monetary policy (measured by growth in nominal

M2 growth), and banking crisis also have negative effects on the output growth after crisis. However, these three variables become statistically insignificant when we use H-P filtered trend.

The regression model could be used to understand the contribution of each factor in the Asian recovery. Fiscal policy played a role in the recovery, but the size of its effect seems to be small. Openness, exports, investment boom, political instability, and banking crisis explain large portion of the output performance in the Asian recovery.

We may draw some lessons from this study. Openness and strong exporting industry could provide a relatively easy path to the recovery. A country should avoid excessive investment, especially if it is financed by short-term borrowing from foreign countries. Stability in political system and healthy banking system are always important policy goals for the country. The macroeconomic policy implication based on this study is similar to Krugman (1999a,b), which is tight monetary policy and expansionary fiscal policy.

This study used a large annual data set for 105 countries. A next step would be a more detailed study with high frequency data. Daily or monthly changes in the financial markets and government policies during the onset of a currency crisis should provide valuable information for the research of recovery.

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### **Appendix 1. List of Countries**

Algeria, Argentina, Bangladesh, Barbados, Belize, Benin, Bhutan, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Rep., Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Cote d'Ivoire, Djibouti, Dominican Rep., Ecuador, Egypt, El Salvador, Equatorial Guinea, Ethiopia, Fiji, Gabon, Gambia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran, Jamaica, Jordan, Kenya, Korea, Laos, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Morocco, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan,

Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Romania, Rwanda, Sao Tome and Princ., Senegal, Seychelles, Sierra Leone, Solomon Islands, Somalia, South Africa, Sri Lanka, St. Vincent & Grenadines, Sudan, Swaziland, Syrian Arab Rep, Tanzania, Thailand, Togo, Trinidad & Tobago, Tunisia, Turkey, Uganda, Uruguay, Vanuatu, Venezuela, Western Samoa, Yemen, Zaire, Zambia, Zimbabwe.

## Appendix 2. Data Definitions and Sources

- Banking crisis: Systemic major bank insolvencies in Caprio and Klingebiel (1996) or Banking crisis in Lindgren, Garcia, and Saal (1996)
- Current account, Fiscal balance, Investment, Nominal and real M2 growth, Total debt, Short-term debt: World Development Indicators, World Bank
- Exports: exports growth rate measured in constant domestic currency, World Development Indicators, World Bank
- GDP Growth rate: World Economic Outlook, IMF
- G7 growth: G7 growth rate is a weighted average rate with the weights given by the US dollar GDP each year. (G7 countries: Canada, France, Germany, Italy, Japan, UK, USA)
- Openness: (Exports + Imports)/GDP, World Development Indicators, World Bank
- Political Failure:  $X_t - X_{t-1}$ ,  $X$ = the sum of four dummies for Ethnic wars, Revolutionary wars, Abrupt or disruptive regime changes, and Genocide/politicides, Center for International Development and Conflict Management (CIDCM), Univ. of Maryland. ([www.bsos.umd.edu/cidcm/stfail/sfcodebk.htm](http://www.bsos.umd.edu/cidcm/stfail/sfcodebk.htm)) Their data coverage ends in 1997. I updated the data for Indonesia based on the article titles from The Wall Street Journal between 1998 and 2000. Ethnic wars are observed in 1999 and 2000, regime changes in 1998 and 1999, revolutionary wars and genocide/politicides in 1998-2000.

\* The article titles regarding political instability in Indonesia from The Wall Street Journal

May 21, 1998: Suharto resigns and vice president takes over – Indonesian chief succumbs to pressure as members of cabinet step down

Nov. 16, 1998: Indonesian reforms fail to head off street violence – Students lose lives in weekend riots

Nov. 23, 1998: Violence intensifies Indonesian power struggle – Muslim groups vie with army leader

Sep. 2, 1999: Pro-Indonesian militiamen terrorize East Timor – Refugees, officials trapped in mission following voting

Sep. 9, 1999: Timor crisis grows as U.N. plans to pull out rest of staff – Martial law unsuccessful; Habibie, generals split on peacekeeping forces

Oct. 20, 1999: Indonesia's Habibie drops out of race for president after no-confidence vote

Oct. 21, 1999: Wahid's election in Indonesia spurs concerns over diverse blocs, backlash

Jan 6, 2000: Indonesia faces another secession threat – West Papuan declaration adds to currency woes, charges of corruption

Jan. 20, 2000: Violence intensifies in Indonesia, putting heat on president to act

May 18, 2000: Indonesia convicts 25 in effort to end bloody conflict in Aceh

Nov. 13, 2000: Rebels say Indonesian forces kill 27 Acehese at rally

Nov. 29, 2000: Drifting apart: Indonesia faces crisis as separatism spreads with nation's turmoil – Short on cash and leadership, Jakarta sees rich Papua join secessionist drive – Hoping to muddle through

- US interest rates: Federal funds rates

### Appendix 3. Regression results from different growth trends

Dependent variable: Real GDP growth rate deviation from trend (H-P filtered)

Variables	Coefficients (t-statistics)		
Openness ( $t_{c-3}$ to $t_{c-1}$ )	0.0242 ** (2.013)	0.0230 ** (2.076)	0.02162 * (1.949)
Investment/GDP ( $t_{c-3}$ to $t_{c-1}$ )	-0.0666 (-1.639)	-0.0681 * (-1.724)	-0.0798 ** (-2.725)
Fiscal balance/GDP ( $t_{c-3}$ to $t_{c-1}$ )	0.0053 (0.135)		
Current account/GDP ( $t_{c-3}$ to $t_{c-1}$ )	0.0074 (0.105)		
Total debt/GDP ( $t_{c-1}$ )	0.0058 (0.568)		
Short-term debt/GDP ( $t_{c-1}$ )	-0.0191 (-0.542)	-0.0118 (-0.491)	-0.0155 (-1.376)
US interest rate (t)	-0.2364 * (-1.925)	-0.2606 ** (-2.463)	-0.2254 ** (-2.339)
G7 growth (t)	0.3958 * (1.813)	0.4394 ** (2.147)	0.2711 (1.490)
Exports (t)	0.0954 ** (4.470)	0.0680 ** (3.212)	0.0689 ** (3.762)
Real M2 growth (t-1)	-0.0002 (-0.091)		-0.0003 (-0.200)
Nominal M2 growth (t-1)			-0.0002 (-1.625)
Change in fiscal balance/GDP (t-1 relative to [ $t_{c-3}$ to $t_{c-1}$ ])	-0.0791 * (-1.916)	-0.0704 ** (-2.405)	
Political failure (t)	-1.1216 ** (-2.127)	-1.1875 ** (-2.699)	-1.1488 ** (-3.226)
Banking crisis (t-1 or t)	-0.6473 (-0.994)	-0.8071 (-1.318)	-0.6965 (-1.364)
Dummy for $t_{c+1}$	-2.2611 ** (-3.644)	-2.5258 ** (-4.061)	-1.3388 ** (-2.459)
Dummy for $t_{c+2}$	-0.8083 (-1.384)	-1.0062 * (-1.788)	-0.7162 (-1.396)
Dummy for $t_{c+3}$ (constant in the regression)	0.9634 (0.625)	1.7974 (1.642)	2.1653 ** (2.122)
R-squared	0.2637	0.2328	0.1749
Number of observations	217	229	306

$t_c$  : year of currency crisis

$t_{c-3}$  to  $t_{c-1}$  : average for the three year period before currency crisis

\*\* : significant at 5 percent, \* : significant at 10 percent

Fixed effects model panel estimation with White's correction for heteroscedasticity.