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Good News, Bad News and Exchange Rate Volatility in the Asian Crisis: A GARCH Application

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1. Introduction

Subsequent to the dramatic fall of the Thai baht on July 2, 1997, other East Asian currencies were also subjected to speculative pressure and the authorities were forced to allow them to depreciate sharply. In fact, the depreciation of East Asian currencies were massive indeed. From July 1997 to May 1998, for example, the Indonesian rupiah depreciated sharply from 2437 rupiah per dollar to 11117 rupiah and the Korean won depreciated sharply from 885 won per dollar to 1406 won (see Figure 1). In order to investigate such movements of East Asian exchange rates during the Asian crisis, it is useful to study the relationship between East Asian exchange rates and the behavior of investors by examining the impacts of economic and political news releases on exchange rates. Because advance computer technology has made the international financial transactions easier and less expensive than ever before and investors have reacted rapidly to economic and political news, it may be possible to think that excessive behavior of investors to news intensified the Asian financial crisis.

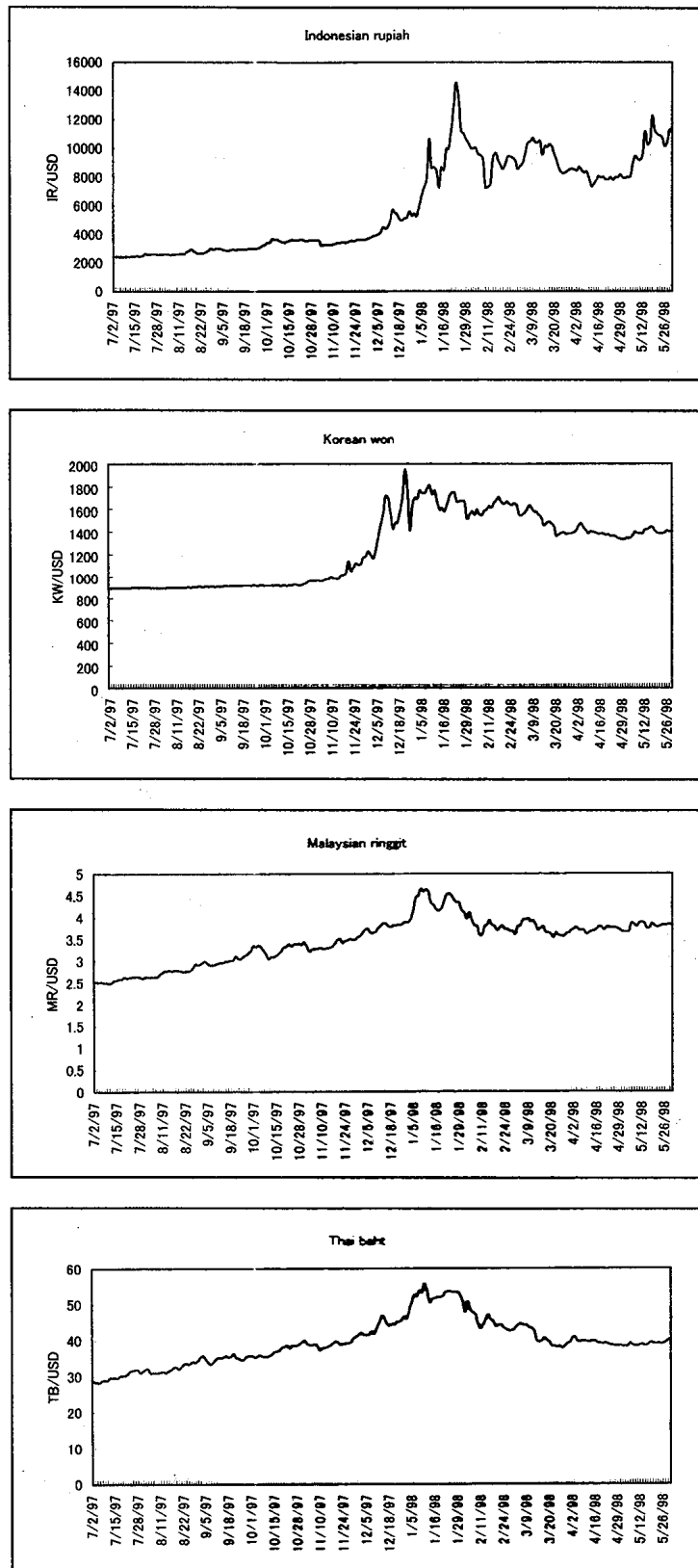
Several authors have examined the responses of asset prices to economic and political news during the Asian crisis by using daily data. Baig and Goldfaji (1999) investigated the responses of financial markets to good and bad news. Kaminsky and Schmukler (1999) analyzed what type of news moves Asian stock markets. They

estimated a simple linear regression of financial data on news dummy variables. However, as pointed by Bollerslev, Chou and Kroner (1992), simple linear regressive models are not able to capture the stylized facts of daily exchange rate movements, such as their contiguous periods of volatility and stability together with their leptokurtic unconditional distributions. Furthermore, simple linear regressive models cannot investigate sufficiently whether economic and political news significantly increased uncertainty among investors in the foreign exchange markets, because they do not consider the impacts of economic and political news on the conditional variance of exchange rate (exchange rate volatility).

Accordingly, we make use of a generalized autoregressive conditionally heteroskedastic (GARCH) methodology to examine the impacts of economic and political good and bad news on East Asian exchange rates during the Asian crisis. The GARCH model makes it possible to examine directly whether economic and political news had significant impact on the time-varying conditional variance of exchange rate (exchange rate volatility). Furthermore, we can examine the asymmetric impact of good news and bad news on exchange rate volatility by using the GARCH model. In addition to own-country news, we examine the impacts of cross-border news on exchange rates to test whether news had spillover effects. If economic and political news significantly increased exchange rate volatility, it can be conjectured that they increased uncertainty among investors in the foreign exchange markets. It is possible to think that, this increased uncertainty would induce investors to generate more herding behavior, and thus, to overreact to news during the Asian crisis.

The paper is organized as follows. Section 2 presents the data of daily news and the GARCH methodology to examine the impacts of economic and political good and bad news on East Asian exchange rates during the Asian crisis. Section 3 shows the summary statistics of daily movements of East Asian exchange rates and the results of applying the GARCH model. Section 4 presents summary and

Figure 1. The Movements of East Asian Exchange Rates against the US Dollar, July 1997-May 1998



Source: Pacific Exchange Rate Service in the University of British Columbia, Canada.

concluding remarks.

2. Data and Methodology

2.1. *Data of Daily News*

To investigate the impacts of news releases on daily movements of East Asian exchange rates during the Asian crisis, it is necessary to collect daily news, which can provide information to investors on both the state of the economy and future policy actions. Data of daily news are obtained from Baig and Goldfajn (1999), Kaminsky and Schmukler (1999) and Roubini's Asian Crisis Homepage (2000).

Here, we classify the daily economic and political news into good and bad news. Following Baig and Goldfajn (1999) and Kaminsky and Schmukler (1999), news of political stability, a stable economy, the upgrade of credit ratings, agreements with international organizations, an expansionary fiscal or monetary policy and the removal of capital controls are classified as good news. Moreover, news of political instability, an unstable economy, the downgrade of credit ratings, a breakdown in negotiation with international agencies, a contractionary fiscal or monetary policy and an announcement of capital controls imposition are classified as bad news.

The sample of daily data is from the outbreak of the Thai crisis in July 2, 1997 to May 31, 1998. The objective countries are Indonesia, Korea, Malaysia and Thailand. East Asian exchange rates against the US dollar are obtained from the *Pacific Exchange Rate Service* in the University of British Columbia, Canada.

2.2. *GARCH Model for the Impact of News on Daily Change in Exchange Rate*

To examine the responses of East Asian exchange rates to news releases during the Asian crisis, we make use of the GARCH methodology.¹ The estimated GRACH models for East Asian currencies are

¹ For details of the GARCH modeling in financial data, see Bollerslev, Chou and Kroner (1992).

as follows,

$$\Delta s_t = 100 \times (\ln S_t - \ln S_{t-1}) = c + b_1 \text{GND}_t + b_2 \text{BND}_t + \varepsilon_t \quad (1)$$

$$\varepsilon_t | \Omega_{t-1} \sim N(0, h_t), \quad (2)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \gamma_1 \text{GND}_t + \gamma_2 \text{BND}_t \quad (3)$$

where S_t is the exchange rate against the US dollar at time t , Δs_t is percent change in exchange rate, ε_t denotes the error term which is dependent on the information set Ω_{t-1} , and h_t is the conditional variance of exchange rate return at time t . GND_t and BND_t are, respectively, dummy variables of own-country good and bad news at time t . The dummy variables GND_t (BND_t) take the value 1 when there are good (bad) news releases and zero otherwise. b_1 and b_2 capture the impacts of good and bad news on exchange rate return (the first moment of exchange rate) and γ_1 and γ_2 capture the impacts of good and bad news on exchange rate volatility (the second moments of exchange rate). Following Baillie and Bollerslev (1989), we select the GARCH (1,1) model for daily data. This model can be estimated by the maximum likelihood method.

Here, by estimating the GARCH model, we test the hypothesis that good news induces an appreciation of the exchange rate ($b_1 < 0$) and bad news induces a depreciation of the exchange rate ($b_2 > 0$). Especially, we test the hypothesis that good and bad news increase exchange rate volatility ($\gamma_1 > 0$ and $\gamma_2 > 0$) and examine whether the impact of bad news on exchange rate volatility is larger than the impact of good news ($\gamma_1 < \gamma_2$). If bad news significantly increased exchange rate volatility, it can be surmised that bad news increased uncertainty among investors in the foreign exchange markets.

3. Empirical Results

3.1. Properties of Data

Before proceeding to apply the GARCH methodology, it may be useful to inspect certain properties of daily percent change in East

Asian exchange rates (Δs_t). Table 1 shows summary statistics of Δs_t . East Asian exchange rates exhibit high volatility during the sample period. From Table 1, we can reject the null hypothesis that the statistics of skewness for all exchange rates, except for the Malaysian ringgit, are zero and the statistics of kurtosis for all exchange rates are three (as is the case with the normal distribution). The Box-Pierce test statistics for high-order serial correlation generally indicate that the squared percentage change exchange rates exhibit substantially more autocorrelation than the unsquared data. This is indicative of strong conditional heteroscedasticity. These results suggest that the appropriate framework for analyzing daily East Asian exchange rates is the autoregressive conditionally hetero-skedastic (ARCH) type modeling strategy.

Table 1. Summary Statistics: Daily Percent Change in Exchange Rates^a

	Indonesian rupiah	Korean won	Malaysian ringgit	Thai baht
Mean	0.666	0.203	0.182	0.144
Standard Deviation	5.360	3.302	1.815	1.899
Minimum	-23.32	-25.70	-5.867	-6.574
Maximum	30.18	14.99	7.089	6.000
Skewness	0.530***	-1.448***	-0.035	-0.473***
Kurtosis	9.696***	22.25***	4.761***	4.611***
$Q_{\Delta s}(12)^b$	15.10	35.30***	24.70**	7.600
$Q_{\Delta s^2}(12)^c$	80.30***	80.20***	45.10***	70.60***

(Notes)

^a ***, ** indicate that the statistics is significant at the 1 and 5 percent levels, respectively.

^b $Q_{\Delta s}(12)$ denotes the Box-Pierce Q-statistic (with 12 lags) for the daily percent change in exchange rate (Δs).

^c $Q_{\Delta s^2}(12)$ denotes the Box-Pierce Q-statistic (with 12 lags) for the squared daily percent change in exchange rate (Δs^2).

3.2. Maximum Likelihood Estimates of the GARCH Model

Table 2 shows the result of estimating the GARCH model by

using the maximum likelihood method.² First, we test whether the GARCH model is appropriate for analyzing the impacts of news releases on exchange rates. The ARCH parameter (α_1) and the GARCH parameter (β_1) are significantly positive in all exchange rates. This indicates that the GARCH parameters (α_1 and β_1) have explanatory power in the daily exchange rate model.³ According to the Box-Pierce test statistics, we can accept the hypothesis of no high-order serial correlation for the standardized residuals and the squared standardized residuals. These results provide support for the GARCH model.

Then, we examine the responses of investors to good and bad news by applying the GARCH model. The impacts of own-country bad news on exchange rate returns are significantly positive in all countries, indicating that bad news induced the depreciation of exchange rates. Moreover, the impacts of own-country good news on exchange rate returns are significantly negative in all countries, indicating that good news induced the appreciation of exchange rates. Markedly, the impacts of own-country good and bad news on exchange rate return in Indonesia are (about three times) larger than the other countries.

On the other hand, the impact of own-country good news on exchange rate volatility is significantly positive at the 10 percent level in the case of the Thai baht. Moreover, own-country bad news significantly increased exchange rate volatilities at the 5 percent level in the cases of the Indonesian rupiah, the Korean won and the Malaysian ringgit.⁴ Interestingly, the impacts of own-country bad

² According to the Box-Pierce test statistics, we rejected the hypothesis of no high-order serial correlation for the percentage change exchange rate in the cases of the Korean won and the Malaysian ringgit. Then, the lagged dependent variable (ΔS_{t-1}) was included in equation (1). However, we did not add ΔS_{t-1} in equation (1), because the coefficients of ΔS_{t-1} were not significant.

³ The sum of α_1 and β_1 is the measure of volatility persistence. This sum is found to be less than unity for all exchange rates.

⁴ According to the likelihood ratio test statistic in Table 2, we rejected the null hypothesis that the conditional variance of exchange rate is time invariant. Accordingly, this result suggests that the GARCH model is appropriate and news dummy variables have explanatory power in the conditional variance of exchange

Table 2. Maximum Likelihood Estimates of the GARCH (1,1) Models^a

	Indonesian rupiah	Korean won	Malaysian ringgit	Thai baht
c	0.008 (0.088)	0.050* (0.032)	0.181* (0.109)	0.202** (0.093)
b_1	-4.863*** (0.832)	-1.203* (0.701)	-1.300*** (0.478)	-1.687*** (0.562)
b_2	3.808*** (0.812)	1.525* (1.051)	1.223*** (0.284)	1.249*** (0.399)
α_0	0.012 (0.017)	0.007*** (0.003)	0.000 (0.000)	0.542** (0.253)
α_1	0.110** (0.047)	0.163*** (0.028)	0.050*** (0.016)	0.328*** (0.115)
β_1	0.776*** (0.038)	0.799*** (0.025)	0.942*** (0.015)	0.451*** (0.155)
γ_1	3.967* (2.424)	1.428 (1.036)	0.003 (0.469)	2.635* (1.551)
γ_2	9.997*** (2.214)	3.220** (1.686)	0.340** (0.164)	0.000 (0.000)
$\alpha_1 + \beta_1$	0.836	0.962	0.992	0.779
Log likelihood	-590.6	-349.2	-424.8	-421.9
LR(4) for $H: \alpha_1 = \beta_1 = \gamma_1 = \gamma_2 = 0^b$	175.7***	462.4***	50.02***	63.88***
$Q_z(12)^c$	6.240	7.040	13.60	6.900
$Q_{z^2}(12)^d$	7.410	8.650	12.30	7.990

(Notes)

^a ***, **, * and # indicate that the statistics is significant at the 1, 5, 10 and 15 percent levels, respectively. The numbers in parentheses are standard errors.

^b LR is the likelihood ratio test statistic for the null hypothesis that exchange rate volatility is time invariant.

^c $Q_z(12)$ denotes the Box-Pierce Q-statistic (with 12 lags) for the standardized residuals ($z = \varepsilon_t(h_t)^{-1/2}$).

^d denotes the Box-Pierce Q-statistic (with 12 lags) for the squared standardized residuals.

news on exchange rate volatilities are larger than those of good news, except for the Thai baht. The impact of own-country bad news on exchange rate volatility in Indonesia is larger than the other countries.

In addition to own-country news dummies, we add cross-border news dummy variables on the right hand side in equations (1) and (3)

to investigate the impacts of cross-border news on exchange rates (spillover effects). Table 3 shows the result of estimating the GARCH models with cross-border news dummies. The GARCH models yield interesting results. The impacts of cross-border good and bad news from Indonesia on exchange rate returns are significantly negative and positive, respectively, in all countries, in addition to own country news being significant. The impacts of cross-border bad news from Korea and good news from Thailand on exchange rate return in Indonesia are significantly positive and negative, respectively.

Table 3. Summary of the GARCH Models with Cross-Border News Dummy Variables^a

	Indonesian rupiah	Korean won	Malaysian ringgit	Thai baht
(a) Exchange Rate Return				
Indonesia: Good news	-	-	-	-
Bad news	+	+	+	+
Korea: Good news		-		
Bad news	+			
Malaysia: Good news			-	
Bad news			+	
Thailand: Good news	-			-
Bad news				+
(b) Exchange Rate Return				
Indonesia: Good news				
Bad news	+	+	+	
Korea: Good news				
Bad news		+		
Malaysia: Good news				
Bad news			+	
Thailand: Good news				
Bad news		+		

(Note)

^a + (-) indicates that the impact of news on exchange rate is significantly positive (negative) at the 10 percent level. In the case of exchange rate return, positive (negative) impact indicates that exchange rate depreciated (appreciated).

Furthermore, the impacts of cross-border bad news from Indonesia and Thailand on exchange rate volatility are significantly positive in the case of the Korean won. In the case of the Malaysian ringgit, cross-border bad news from Indonesia significantly increased exchange rate volatility. The evidences of estimating the GARCH models with cross-border news dummies suggest that economic and political news significantly had spillover effects. As a result, we conclude that bad news increased uncertainty among investors in the foreign exchange markets. Then, this increased uncertainty would induce investors to overreact to bad news.

4. Summary and Concluding Remarks

In this paper, we have applied the GARCH methodology to examine the impacts of news releases on East Asian exchange rates during the Asian crisis. It is shown that daily movements of East Asian exchange rates were triggered by economic and political good and bad news. Own-country bad news had strong downward impact on exchange rates in all countries and own-country good news had upward impact on exchange rates during the Asian crisis. Moreover, cross-border good and bad news from Indonesia had significant impacts on exchange rate returns in the cases of the Korean won, the Malaysian ringgit and the Thai baht.

Interestingly, own-country bad news did increase exchange rate volatility. Moreover, cross-border bad news from Indonesia significantly increased exchange rate volatilities in the cases of the Korean won and the Malaysian ringgit. These results indicate that bad news increased uncertainty among investors in the foreign exchange markets. This increased uncertainty would induce investors to generate more herding behavior, and thus, to overreact to bad news during the Asian crisis. Hence, such behavior of investors may have intensified the Asian financial crisis.

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