Diagnosing Shocks in Stock Market Returns of Greater China*

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Using a modified outlier identification procedure by Chen and Liu (1993), this article studies the large shocks of the Greater China stock markets. We find that while large shocks are typical in all the markets and more outliers appear in the Chinese stock markets than in the other markets. We also find that most of the outliers identified in the Hong Kong market cluster in the periods of the 1997 Asian financial crisis and after the government's market intervention in August 1998. With the exception of Hong Kong, most outliers seem to be driven by local events (JEL C52, G14, G15).

Keywords: Greater China stock markets, large shocks, time series outliers.

I. Introduction

The emergence of the Greater China economic bloc triggered by the economic reform in China since the early eighties has been a subject of increasing interest in recent years (see, for example, Ash and Kueh, 1993; Jones et al. 1993; Naughten, 1997; Sung, 1992, among others). The three Greater China economies, namely, the ethnically homogeneous China, Hong Kong and Taiwan, complement one another, with China providing land and labor for manufacturing at low costs, and Taiwan and Hong Kong providing capital and technical expertise.

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An important component of economic reforms in China is her financial liberalization. Since the early 1990s, China has initiated a series of policies for financial liberalization. To enhance the capacity to raise capital, the State Council Securities Commission of China allowed her two stock exchanges, Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE), to issue B-shares for foreign investors, in addition to the A-shares which only domestic investors are allowed to buy. In addition, selected companies in China are allowed to list, referred to as the H shares, in the Stock Exchange of Hong Kong (SEHK). There are also Hong Kong registered companies that have powerful links with state-owned companies in Mainland China. These companies, referred to as Red Chips, are the arms of their mainland parents to raise capital. Hong Kong, being the most developed and least regulated capital market in the Greater China region, has become an important channel for China's enterprises to raise capital.

Empirical studies indicate that emerging stock markets tend to become larger, more liquid, more volatile, and more integrated after financial market liberalization (Levine and Zervos, 1998; Ragunathan, 1999). There are increasing numbers of studies to investigate the performance of the Greater China stock markets in recent years (Song et al., 1998; Su, 1999; Su and Fleisher, 1999; Xu and Wang, 1999; Chou, et al., 1999; and Lee et al., 1999). These studies focus on the returns and volatility of the emerging markets, investors behaviour, and the linkages to the mature markets such as the United States'. Moreover, some evidence indicates that the stock markets in the Greater China economies are integrated, with Hong Kong as the leading market in stock returns (Chan et al., 1999).

This paper addresses the Greater China stock market integration by analyzing the large shocks of the stock markets. This is important because large shocks are likely to be typical in macroeconomic time series (Blake and Fomby, 1994). Since investors looking for cross-border investment opportunities consider the risk diversification as well as the rate of return, it is important to understand reaction of these economies to important events such as the political turmoil and financial crisis. The remaining part of this paper is organized as follows. Section II gives a description of the time series outlier models. Section III contains the data description and empirical results. The last section concludes.

II. Methodology

Shocks in a time series can be quantified by outlier models. In this section we review the time series outlier detection approach due to Chen and Liu (1993). We shall restrict the discussion to points necessary for describing the applications in this paper. Further details can be found in Tsay (1988), Chen and Liu (1993) and Balke and Fomby (1994).

Suppose that an outlier-free time series X_t has the stationary ARMA (p,q) representation:

$$\phi(L)X_t = \theta(L)e_t, \tag{1}$$

where L is the *lag* operator such that $L^s X_t = X_{t-s}$,

$$\phi(L) = 1 - \phi_1 L - \cdots - \phi_p L^p,$$

$$\theta(L) = 1 - \theta_1 L - \cdots - \theta_q L^q,$$

and e_t is i.i.d. $N(0, \sigma^2)$.

Time series are often susceptible to external shocks such as famine, war, changes in government policies and so on. The consequences of these interruptive shocks create aberrant observations, which are usually referred to as outliers. Most outliers are not simply spurious observations (e.g., recording or typing errors). They may contain important information about the external shocks affecting the series. In general, outliers in time series can be viewed as the result of nonrepetitive interventions. Thus, a contaminated time series Y_t consists of an outlier-free time series X_t plus an exogenous intervention effect $\Delta_t(t,\omega)$, i.e.,

$$Y_t = X_t + \Delta_t(T,\omega),$$

where T is the location of the outlier and ω is the magnitude of the outlier.

Four commonly used types of outliers (see Tsay, 1988) are employed to quantify the possible impact of a shock. They are additive outlier

(*AO*), innovational outlier (*IO*), level shift (LS), and temporary change (*TC*). An additive outlier affects only the level of the given observation while an innovational outlier affects all observations beyond the given time through the memory of the underlying outlier-free process. A level shift is an event that affects a time series at a particular time point whose effect becomes permanent. A temporary change is an event having an initial impact and whose effect decreases exponentially according to a fixed dampening parameter, say, δ. In practice the value of δ often lies between .6 and .8 (Liu and Hudak, 1994, p.76). We employ $d = .7$ in this article as recommended by Chen and Liu (1993).

Chen and Liu (1993) suggested a method for modelling time series with outliers. Their approach consists of a three-stage iterative procedure based on detection, estimation and adjustment. The outlier-free time series X_t in equation 1 can be written as a linear combination of the current and past innovations, i.e.,

$$X_t = \psi(L)e_t, \tag{2}$$

where

$$\psi(L) = \theta(L)/\phi(L) = 1 - \psi_1 L - \psi_2 L^2 \ldots, \tag{3}$$

The fitted residuals $\hat{e}_t = \left(Y_t - \hat{Y}_t\right)$, which may be contaminated with outliers, can be expressed by a dummy variable time series regression:

$$\hat{e}_t = \omega D(i,t) + \varepsilon_t, \tag{4}$$

for $i = AO, IO, LC$ and TC, where $D(i, t)=0$ for all i and $t < T$, $D(i, t) = 1$ for all i and $t = T$, and

$$D(AO,t) = -\psi_{t-T},$$

$$D(IO,t) = 0,$$

$$D(LS,t) = 1 - \sum_{j=1}^{t-T} \psi_j,$$

$$D(TC,t) = \delta^{t-T} - \sum_{j=1}^{t-T-1} \delta^{t-T-j}\psi_j - \psi_{t-T} \ ,$$

for $t > T$.

The maximum value of the standardized *t*-statistic for the slope (outlier effects) of the above regression in equation 4 can be used for detecting outliers, i.e.:

$$T = \max_{1 \le T \le n} \quad \max_{i \in \{AO,IO,LS,TC\}} \{\tau(i,T)\}$$

where

$$\tau(i,T) = \frac{\hat{\omega}(i,T)}{\sqrt{Var\left[\hat{\omega}(i,t)\right]}} \ ,$$

with

$$\hat{\omega} = \frac{\sum_{t=T}^{n} \hat{e}_t D(i,t)}{\sum_{t=T}^{n} \left[D(i,t)\right]^2} \ ,$$

and

$$Var\left[\hat{\omega}(i,t)\right] = \frac{\hat{\sigma}^2}{\sum_{t=T}^{n} \left[D(i,T)\right]^2} \ .$$

For a given location, these standardized statistics follow a normal distribution approximately. An outlier is detected if T is greater than a critical value C. We employ C = 3.5 (as recommended by Liu and Hudak, 1994) in this paper. With the type and the location of an outlier, we can jointly re-estimate the model parameters and the outlier effects. After the estimation, one can adjust the outlier effects on the observations. The detection-estimation-adjustment cycle is repeated for the adjusted series until no new outliers are found. Finally, the model is re-estimated for the ARMA parameters and all outlier effects simultaneously.

III. Data and Empirical Results

The following daily market indices are used to represent the market activities of the various regions in Greater China. The Hang Seng Index is chosen as a proxy of the stock market activities in Hong Kong. The index is composed of 33 constituent stocks selected from all sectors. It is market-value weighted and represents about 70% of total market capitalization. The Shanghai B-share index and Shenzhen B- share index, market-value weighted of all the listed B shares in the respective markets, are analyzed in this paper. The B-shares, being restricted to foreign investors who are mostly institutional investors, are less speculative than the A-shares and are more closely related to economic fundamentals (Brooks, 1995). The Taiwan Stock Exchange capitalization weighted stock index is the most widely quoted index of all the Taiwan Stock Exchange indices. This index covers all listed stocks excluding preferred stocks, full-delivery stocks and newly listed stocks which have been listed for less than one month. Our study covers the period from 5 October 1992 to 31 May 1999, giving a total of 1,736 daily time series observations. All indices are in local currencies. The data were obtained from Datastream.

Table 1 provides several descriptive statistics for market return time series, including mean, standard derivation, skewness and excess kurtosis. The coefficients of skewness are all significantly greater than zero except for the Taiwan market. Tests of significance of excess kurtosis in these markets indicate that Hong Kong and Mainland markets all have heavy "tail" return distributions.

The correlation matrix for market returns is:

	Hong Kong	Shanghai	Shenzhen	Taiwan
Honk Kong	1			
Shanghai	.2297	1		
Shenzhen	.158	.5415	1	
Taiwan	.1867	.0908	.0546	1

TABLE 1. Descriptive Statistics

Market	Mean	Std. Dev.	Skewness	Kurtosis	Minimum	Maximum
Hong Kong	.0004	.0189	.1379	6.98	–.1473	.1725
Shanghai	–.0003	.0209	.4956	2.72	–.1308	.1218
Shenzhen	–.0004	.0210	.2161	9.17	–.1670	.1380
Taiwan	.0004	.0155	.0840	0.02	–.0778	.0852

All correlation coefficients are positive. With 1,735 observations, the values over .048 would be significant at a 2.5% level, so four out of these six coefficients are highly significant, and the other two (correlations between Taiwan and the two Mainland markets) are not vastly significant.

We apply the procedure suggested by Chen and Liu (1993) to identify the large shocks in the four stock markets. The events associated with outliers are gathered from newspapers and magazines published in Hong Kong. The results are reported in the appendix. It is interesting to compare the nature of the events generating the outliers in the different markets. Most of the outliers in the Hong Kong market are generated by external events such as price movement in the major stock markets, particularly in the US stock market. This result is not surprising because the stock market in Hong Kong is the most developed and open among the Greater China economies.

The events related to the outliers in the Chinese markets are more difficult to identify. For a number of dates, there are no plausible events to explain the outliers. The event entries of these dates are left empty in the table of the appendix. Apparently many of the outliers are related to 'local factors' such as government policy announcement or execution. Similar observation is marked in the Taiwan market. Most of the outliers there seem to be generated by the government announcement of new policies. The only event that generated outliers in all the markets was the US market plunge on October 29, 1997.

It should be noted that an *AO* affects only the observation on that day. On the other hand, both *IO* and *TC* shocks create a wave of impact which may last for a couple of days. An *LC* outlier changes the

TABLE 2. Distribution of the Types of the Detected Shocks

Types of	Hong Kong		Shanghai		Shenzhen		Taiwan	
Outliers	Number	%	Number	%	Number	%	Number	%
AO	5	24	16	59	32	54	10	77
IO	12	57	6	22	14	24	0	0
TC	4	19	4	15	12	20	3	23
LC	0	0	1	4	1	2	0	0
Total	21	100	27	100	59	100	13	100

level of the series permanently. We perform a classification study of the types of the event shocks in the appendix. The distribution of the four types of outliers detected in each market is given in table 2. It is found that most *IO*'s and *TC*'s are generated by external events, such as extraordinary price or interest rate movements in the US market. The Hong Kong market is more sensitive to these types of shocks. The outliers detected in the Chinese markets and the Taiwan market are mostly *AO*'s. These shocks are usually related to local events. Finally, *LC* is rarely found in these markets. The *LC* shock detected in May 1999 in the Shanghai market is due to the announcement of new regulations. The change in regulations creates a permanent shift of the level of the series in the Shanghai market.

The timing and size of the outliers are plotted as the time lines in figure 1. The time lines clearly show distinctly different patterns across the economies. First, the Chinese stock markets contain significantly more outliers. This contrasts sharply with the Taiwan market, where only sporadic outliers are identified. The Hong Kong market has apparently more outliers identified than Taiwan, despite the fact that the former possesses a more mature stock market. It may be due to the fact that the Taiwan government has closely monitored and intervened in the market activities. Moreover, a closer inspection reveals that there are clusters of outliers in the Hong Kong market in the periods from October 1997 through March 1998 as well as June 1998 through January 1999. This is an indication that Hong Kong has been harder hit by the episode of the 1997 Asian financial crisis, whereas Taiwan was basically immunised. Finally, it is found that the number of positive shocks and the number of negative shocks within

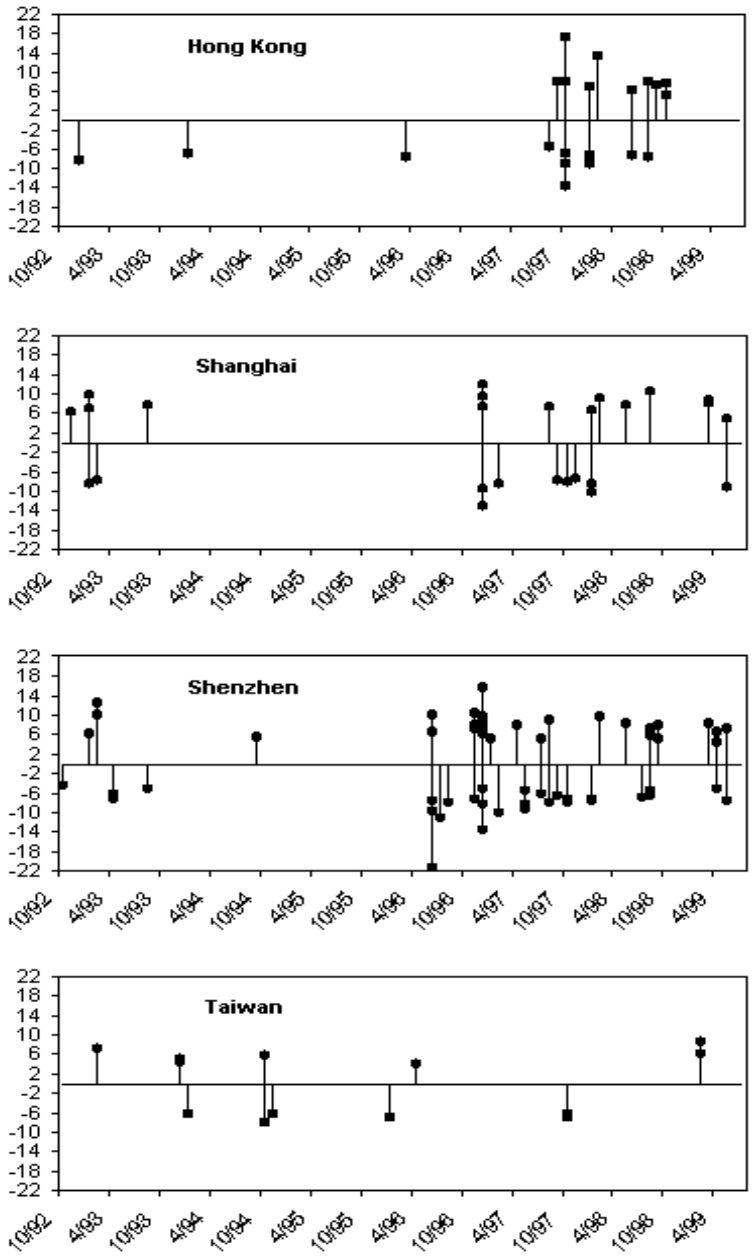

FIGURE 1.—Sizes and Timings of the Detected Shocks

TABLE 3. Sample Variances for Returns in Different Markets

	Hong Kong	Shanghai	Shenzhen	Taiwan
Before Outlier Adjustments	3.5721 %^{2}	4.3823 %^{2}	4.4108 %^{2}	2.3872 %^{2}
After Outlier Adjustments	2.5209 %^{2}	3.0560 %^{2}	1.7012 %^{2}	2.0454 %^{2}
Percentage of Volatility Reduction due to Outliers	29.0%	30.0%	61.0%	14.0%

each market are roughly the same.

To show the degree of significance of outliers, we compute the sample variance of the four markets with the outliers suppressed. The results are reported in table 3. The outliers are most significant in Shenzhen, accounting for 61% of the sample variance, whereas outliers in Taiwan market contribute to only 14% of the market volatility. These results indicate that the Chinese markets are more susceptible to large shocks.

VI. Conclusion

Using a modified outlier identification procedure by Chen and Liu (1993), we analyse the large shocks in the stock markets of Hong Kong, Shanghai, Shenzhen and Taiwan. We find that large shocks are found in all the markets that we investigate. Several patterns emerge. First, with the exception of Hong Kong, the outliers seem to be driven by local events. In particular, the outlier pattern of the Taiwan market is distinctively different. Second, more outliers are detected in the Chinese stock markets than in the other markets. The fact that the Chinese markets are more susceptible to large shocks could have strong implication in the risk diversification of investment portfolio. Lastly, most of the outliers identified in the Hong Kong market appear in the periods of the 1997 Asian financial crisis and after the Government's market intervention in August 1998. It is interesting to observe that the government market intervention in August 1998 seems to make the market more susceptible to large shocks.

Appendix A. Hong Kong Hang Seng Index

Date	Size	*t*-ratio	Type	Event
12/3/92	–8.190	–5.13	*IO*	China and the UK failed to reach agreement on the Hong Kong's political reform.
1/6/94	6.820	–4.27	*AO*	Nomura suggested to lower the holding of Hong Kong stocks, triggering the sales of Hong Kong stock by US and Japanese investors.
3/11/96	–7.588	–4.76	*AO*	US stock market plunged; the tension in the Taiwan Straight increased.
8/28/97	–5.323	–4.56	*TC*	Speculative attack in Asian currencies; the overnight HIBOR reached 8 percent.
9/3/97	8.242	5.09	*IO*	A rapid surge in the US stock market;
10/20/97	–6.820	–5.67	*TC*	US stocks plunged; Taiwan currency depreciated in response to the currency attack.
10/23/97	–8.736	–5.33	*IO*	HKMA sucked up the interbank market liquidity, overnight HIBOR reached 300 percent.
10/24/97	8.333	5.14	*IO*	There were the rumors that China injected funds into the Hong Kong to stabilize the stock market; market rebound.
10/28/97	–13.63	–8.51	*AO*	US stock market plunged.
10/29/97	17.257	10.78	*IO*	Market rebound.
1/12/98	–8.878	–5.56	*IO*	A major local financial firm announced bankruptcy; increase in mortgage interest rate.
1/13/98	7.105	4.45	*IO*	Market rebound.
1/15/98	–7.052	–4.42	*AO*	Tung Chee Wah explained to members of Legislative Council that the economy was slowing down.
2/2/98	13.466	8.43	*IO*	US investors injected funds in the Hong Kong market.
6/17/98	6.321	5.37	*TC*	The central banks of US and Japan jointly intervened the foreign market to stabilize the Yen.
6/22/98	–6.936	–4.25	*AO*	Standard and Poor assigned a negative rating to HSBC which is a major financial institution in Hong Kong.
8/14/98	8.294	5.19	*IO*	The Hong Kong Government intervened the stock market by injecting US$15 billions.
8/31/98	–7.305	–4.57	*IO*	Yen fell.
9/7/98	7.322	4.58	*IO*	The Hong Kong Government announced a series of measures to fortify the linked exchange system.
10/9/98	5.401	4.66	*TC*	Expectation of interest rate reduction.
10/16/98	7.846	4.88	*IO*	US announced an interest rate reduction of 1/4 percent.

Appendix B. Shanghai B-share Index

Date	Size	*t*-ratio	Type	Event
11/3/92	6.654	4.01	*AO*	Beijing highly regarded the meeting between the representatives from two quasi-official organizations across the strait
1/14/93	7.086	4.16	*AO*	Rumors that prop-open door leader would be a vice-chairman of the State Council.
1/15/93	10.061	5.90	*AO*	The U.S. consulate in Hong Kong openly supported China's accession to GATT.
1/19/93	–8.129	–4.91	*AO*	
2/3/93	–7.662	–4.62	*AO*	
8/12/93	8.094	4.74	*IO*	
12/3/96	9.778	5.73	*IO*	Government official reassured the stability in RMB.
12/9/96	12.301	7.93	*TC*	The State Statistic Bureau reported record high in sales and production growth rates.
12/11/96	–12.920	–8.08	*TC*	Government began the investigation of the mis-conduct of certain securities firms.
12/13/96	–9.273	–5.23	*IO*	China imposes limits on price fluctuation in both the Shangshai and Shenzhen stock exchanges.
12/18/96	7.514	4.52	*AO*	Premier Zhu emphasized the stability in economic growth in his economic report submitted to the State Council.
2/18/97	–8.306	–5.01	*AO*	Premier Zhu emphasized the stability in economic growth in the economic report submitted to the Congress.
8/14/97	7.626	5.28	*TC*	Government announced that the it will increase direct financing in the state owned enterprises
9/2/97	–7.563	–4.56	*AO*	Hong Kong stock market hit its lowest point of the year.
10/28/97	–7.955	–4.80	*AO*	US market plunged.
11/24/97	–7.140	–4.18	*IO*	
1/12/98	–8.192	–4.83	*AO*	
1/13/98	6.742	4.46	*TC*	The National Bureau of Statistic released that there was improvement in the efficiency of industrial production.
1/15/98	–10.200	–6.00	*AO*	

Appendix B. (Continued)

Date	Size	*t*-ratio	Type	Event
2/9/98	9.397	5.50	*IO*	The Deputy Minister of Finance announced the issuance of Treasury bonds for 1998.
5/15/98	7.976	4.81	*AO*	The State Development Planning Commission announced that there would be 117 state-run projects for 1998.
8/5/98	10.802	6.52	*AO*	
3/18/99	8.168	4.93	*AO*	The Ministry of Trade announced that the medium-large state owned enterprises must finish restructuring by the end of year 2000.
3/22/99	8.802	5.15	*IO*	The Ministry of Finance released that the government will increase the weight of direct financing in the state owned enterprises
3/29/99	8.376	5.05	*AO*	Expectation that interest rate would fall.
5/10/99	–8.888	–5.36	*AO*	NATO bombed the Chinese embassy in Yugoslavia.
5/24/99	5.036	5.77	*LS*	Government announced to imposed regulations on the management of foreign securities firms in China

Appendix C. Shenzhen B-share Index

Date	Size	*t*-ratio	Type	Event
10/13/92	–4.389	–4.08	*TC*	The Shenzhen City Government confirmed that government officials were involved in the recent IPO scandal.
1/8/93	6.216	4.80	*IO*	US Senators met with Chinese leaders in Beijing; both sides showed good intention to improve US-China relationship.
2/5/93	12.596	9.74	*IO*	China would reduce the tax rate of the SOEs (state owned enterprises).
2/8/93	9.996	7.92	*AO*	
4/2/93	–6.151	–4.87	*AO*	A US congressman vowed to put pressure on China regarding issues on intellectual property rights and human rights protection.
4/22/93	–7.337	–5.81	*AO*	The government announced the intention to tighten credit control in order to stabilize foreign exchange rate.
8/3/93	–5.209	–4.13	*AO*	Premier Zhu announced that government would continue to intervene the foreign exchange market.
9/26/94	5.379	4.26	*AO*	The Inland Revenue Department announced that a new tax collection system would be imposed.
6/13/96	9.910	7.70	*TC*	An issuance of national debts was overly subscribed.
6/14/96	6.376	4.76	*TC*	China's was rated favourably by the Standard and Poor.
6/17/96	–9.772	–7.29	*AO*	US-China continued the talk on the intellectual property rights.
6/19/96	–21.270	–16.59	*AO*	
6/24/96	–7.474	–5.76	*IO*	Banks were requested to take measures to help alleviating SOE’s financial problems.
6/25/96	–7.541	–5.97	*AO*	
7/1/96	–11.130	–8.82	*AO*	Expectation of more stringent credit policy.
8/12/96	–8.062	–6.39	*AO*	The People's Bank of China admitted that the central bank's interest rate determination mechanism is problematic.
11/18/96	7.217	6.67	*TC*	The State Bureau of Statistics released the price statistic, indicating that the inflation was under control.
11/25/96	10.555	8.34	*AO*	

Appendix C. (Continued)

Date	Size	*t*-ratio	Type	Event
11/27/96	–7.208	–5.57	*IO*	
11/28/96	7.969	7.09	*TC*	China announced intention to open the current account.
12/2/96	6.016	4.47	*IO*	The Chinese SEC announced intention to speed up the equity market development.
12/9/96	8.220	6.51	*AO*	The State Statistic Bureau reported record high in sales and production growth rates.
12/11/96	–5.184	–4.45	*TC*	Government began the investigation of the mis-conduct of certain securities firms.
12/13/96	–13.580	–11.53	*TC*	China imposes limits on price fluctuation in the both the Shanghai and Shenzhen stock exchanges.
12/18/96	15.838	12.38	*AO*	Premier Zhu emphasized the stability in economic growth in his economic report submitted to the State Council.
12/23/96	7.753	6.13	*AO*	The State Information Center expected that the stock markets would be expanded rapidly.
12/27/96	9.848	7.61	*IO*	Enterprises related to highway operation would be allowed to issue new shares in foreign markets.
12/30/96	6.718	5.19	*IO*	The State Bureau of Statistics announced that the macroeconomic adjustment was effective.
12/31/96	–8.185	–6.48	*AO*	The State Planning Commission forecast that the foreign debt would be 11 billion US dollars.
1/7/97	5.267	4.17	*AO*	33 additional corporations were granted to issue B-share.
2/18/97	–10.030	–7.95	*AO*	The State Administration of Foreign Exchange announced measures enforcing securities firms to submit trading statistics.
4/17/97	8.041	6.22	*IO*	The Ministry of Finance announced the procedure to manage national debt.
5/16/97	–9.367	–7.42	*AO*	Four companies were suspended trading in the exchange.
5/22/97	–8.349	–6.61	*AO*	SOEs and listed companies would be forbidden to speculate in stock markets
5/26/97	–5.582	–4.42	*AO*	
7/3/97	–5.998	–5.52	*TC*	The Chinese SEC announced to eliminate the membership of 11 futures brokerage firms.
7/10/97	5.074	4.67	*TC*	

Appendix C. (Continued)

Date	Size	*t*-ratio	Type	Event
8/14/97	8.856	6.85	*IO*	The Minister Government announced that the it will increase direct financing in the state owned enterprises
8/19/97	–7.754	–5.99	*IO*	The institute of Economic planning suggested to speed up the pace of corporate mergers and bankruptcy.
9/2/97	–6.670	–5.28	*AO*	Hong Kong stock market hit its lowest point of the year.
10/23/97	–7.157	–5.67	*AO*	The People's Bank in Shenzhen lowered the bank's deposit rate.
10/28/97	–7.961	–6.31	*AO*	The State Administration of Foreign Exchange released that foreign debt were up US$2.36 billions in the first six months of 1997.
1/12/98	–7.646	–6.06	*AO*	
1/15/98	–7.132	–5.65	*AO*	The State Development Planning Commission announced that there would be 117 state-run projects for 1998.
2/9/98	9.543	7.38	*IO*	The Vice Minister of Finance discussed the 1998 national debt issuance.
5/15/98	8.425	6.67	*AO*	The State Development Commission announced 117 state-run projects for 1998.
7/29/98	–6.725	–5.20	*IO*	
8/4/98	–5.316	–4.21	*AO*	
8/6/98	–6.344	–5.88	*TC*	
8/14/98	5.777	4.57	*AO*	The Ministry of Finance indicated the intention to increase the issuance of national debt.
8/19/98	7.170	5.68	*AO*	The Trade Bureau indicated that the demand for investment goods would increase in the second half of the year.
9/4/98	7.775	6.01	*IO*	Released figures from the Bureau of Statistics indicated that the consumer confidence has been strengthened.
9/15/98	5.148	4.08	*AO*	The vice-commissioner of the Bureau of Statistics announced that China's productivity had increased rapidly.
3/11/99	8.222	6.36	*IO*	

Appendix C. (Continued)

Date	Size	*t*-ratio	Type	Event
4/7/99	4.454	4.12	*TC*	The president of the People's Bank of China announced the measures to reinforce the bank's functions as a central bank.
4/15/99	6.497	5.05	*AO*	Premier Zhu's visit to the United States had been successful.
4/16/99	–5.003	–4.56	*TC*	China's export in the first quarter of 1999 dropped by 7.8%.
5/10/99	–7.632	–6.05	*AO*	NATO bombed the Chinese embassy in Yugoslavia.
5/27/99	7.164	8.22	*LS*	

Appendix D. Taiwan Stock Exchange Capitalization Weighted Stock Index)

Date	Size	*t*-ratio	Type	Event
2/1/93	7.388	5.15	*AO*	
12/13/93	5.036	4.91	*TC*	Government figures indicated significance increase in overseas investment.
12/30/93	4.474	4.36	*TC*	The Minister of Finance proposed to lower the transaction fee in trading stock.
1/13/94	–6.179	–4.30	*AO*	Taiwan announced a tough stand against China on the issue of unification between China and Taiwan.
10/11/94	–7.802	–5.44	*AO*	A major local brokerage announced bankruptcy.
10/12/94	5.862	4.08	*AO*	Taiwan government assured that investors' interest would be preserved.
11/1/94	–6.328	–4.41	*AO*	Labour strikes.
1/5/96	–6.996	–4.87	*AO*	The government imposed capital gain tax in stock transaction.
4/5/96	4.174	4.07	*TC*	Stanley-Morgan included Taiwan in the Stanley-Morgan Index.
10/20/97	–6.827	–4.76	*AO*	Taiwan currency was attacked. The central bank interfered to stabilize the exchange rate.
10/28/97	–6.107	–4.26	*AO*	US market plunged; Chairman Zhiang met with President Clinton.
2/8/99	6.146	4.28	*AO*	The Ministry of Finance released that government would loosen control in the stock market.
2/22/99	8.500	5.92	*AO*	The Ministry of Finance announced to lower the commercial tax rate.

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