

assumed to be common to all firms and slope coefficients  $\beta_q$  are constant in the quarterly period. We further assume that slope coefficients  $\beta_q$  are modeled as in equation (7).

$$r_{ht} = \alpha + \sum_{q=1}^K \left( \bar{\beta}_q + \omega_t + \gamma T_{ht} \right) + \delta^L L_{ht} + \delta^M M_{ht} + \lambda^L L_{ht} T_{ht} + \lambda^M M_{ht} T_{ht} \Big) R_t^m + v_{ht} \quad (7)$$

where the coefficients  $\alpha, \bar{\beta}_q, \gamma, \omega_t, \delta^L, \delta^M, \lambda^L, \lambda^M$  are unknown parameters, and  $v_{ht}$  is an error term.

$\alpha$  = constant term

$\bar{\beta}_q$  = coefficients of  $R_{ht}^m$  common to large scale firms, medium scale firms, and small/OTC firms

$\omega_t$  = time specific effect for each quarter period.

$\gamma$  = coefficient of  $T_{ht}$  which is effects specific to period when the official prices are reduced.

$\delta^L$  = effect specific to large scale firms

$\delta^M$  = effect specific to medium scale firms

$\lambda^L$  = coefficient of  $L \cdot R_{ht}^m$  which is effect specific to large scale firms in the period of official price reduction.

$\lambda^M$  = coefficient of  $M \cdot R_{ht}^m$  which is effect specific to medium scale firms in the period of official price reduction.

Slope coefficients  $\beta_q$  in equation (6) is modeled in equation (7) as the sum of a constant part of  $\bar{\beta}_q$ , the time effect specific  $\omega_t$ , the time effects specific to the period when the official prices are reduced  $\gamma$ , the individual effect specific to large scale firms  $\delta^L$ , the individual effects specific to medium scale firms  $\delta^M$ , and the effect specific to large scale firms in the period of official price reduction  $\lambda^L$ , and the effect specific to medium scale firms in the period of official price reduction  $\lambda^M$ . What we are concerned is to find  $\lambda^L$  and  $\lambda^M$ . A preliminary estimation indicates that an intercept is common to all firms.

$$r_{ht} = \alpha + \sum_{q=1}^K \beta_q^{All} R_t^m + \sum_{q=1}^K \beta_q^L R_t^m + \sum_{q=1}^K \beta_q^M R_t^m + v_{ht} \quad (8)$$

$\beta_q^{All}$  = coefficients of  $R_{ht}^m$  common to large scale firms, medium scale firms, and OTC firms

$\beta_q^L$  = coefficients of  $R_{ht}^m$  common to large scale firms.

$\beta_q^M$  = coefficients of  $R_{ht}^m$  common to medium scale firms.

We assume that the following conditions met and apply the OLS to obtain unbiased estimates.

$$\text{cov}(v_{ht}, \omega_t, R_t^m) = 0, \text{cov}(v_{ht}, \gamma, T_{ht} R_t^m) = 0, \text{cov}(v_{ht}, \delta^L L_{ht} R_t^m) = 0, \text{cov}(v_{ht}, \delta^M M_{ht} R_t^m) = 0$$

$$\text{cov}(v_{ht}, \lambda^L L_{ht} R_t^m) = 0, \text{cov}(v_{ht}, \lambda^M M_{ht} R_t^m) = 0$$

$$E(\hat{\beta}_{q,T}^L) = \bar{\beta} + \omega_t + \gamma + \delta^L + \lambda^L \quad (9)$$

$$E(\hat{\beta}_{q,T}^M) = \bar{\beta} + \omega_t + \gamma + \delta^M + \lambda^M \quad (10)$$

$$E(\hat{\beta}_{q,T}^{All}) = \bar{\beta} + \omega_t + \gamma \quad (11)$$

$$E(\hat{\beta}_{q-4,N}^L) = \bar{\beta} + \omega_{t-4} + \delta^L \quad (12)$$

$$E(\hat{\beta}_{q-4,N}^M) = \bar{\beta} + \omega_{t-4} + \delta^M \quad (13)$$

$$E(\hat{\beta}_{q-4,N}^{All}) = \bar{\beta} + \omega_{t-4} \quad (14)$$

Where subscript T stands for the quarterly periods when the official prices are reduced, and N for the periods the official prices are not updated. What we are concerned is to find the unbiased estimates of  $\lambda^L$  and  $\lambda^M$ .

$$D_{T,N}^L = E(\hat{\beta}_{q,T}^L) - E(\hat{\beta}_{q-4,N}^L) = \omega_q - \omega_{q-4} + \lambda^L \quad (15)$$

$$D_{T,N}^M = E(\hat{\beta}_{q,T}^M) - E(\hat{\beta}_{q-4,N}^M) = \omega_q - \omega_{q-4} + \lambda^M \quad (16)$$

$$D_{T,N}^{All} = E(\hat{\beta}_{q,T}^{All}) - E(\hat{\beta}_{q-4,N}^{All}) = \omega_q - \omega_{q-4} \quad (17)$$

$$DD_{T,N}^{L-All} = D_{T,N}^L - D_{T,N}^{All} = \lambda^L, \quad DD_{T,N}^{M-All} = D_{T,N}^M - D_{T,N}^{All} = \lambda^M \quad (18)$$

In the same manner we have the following equations.

$$D_{N,T}^L = E(\hat{\beta}_{q,N}^L) - E(\hat{\beta}_{q-4,T}^L) = \omega_q - \omega_{q-4} - \gamma - \lambda^L \quad (19)$$

$$D_{N,T}^M = E(\hat{\beta}_{q,N}^M) - E(\hat{\beta}_{q-4,T}^M) = \omega_q - \omega_{q-4} - \gamma - \lambda^M \quad (20)$$

$$D_{N,T}^{All} = E(\hat{\beta}_{q,N}^{All}) - E(\hat{\beta}_{q-4,T}^{All}) = \omega_q - \omega_{q-4} - \gamma \quad (21)$$

$$DD_{N,T}^{L-All} = D_{N,T}^L - D_{N,T}^{All} = -\lambda^L, \quad DD_{N,T}^{M-All} = D_{N,T}^M - D_{N,T}^{All} = -\lambda^M \quad (22)$$

Thus we obtain the unbiased estimates of  $\lambda^L$  and  $\lambda^M$  both by equations (18) and (22). Also we have

$$D_{T,T}^L = E(\hat{\beta}_{q,T}^L) - E(\hat{\beta}_{q-4,T}^L) = \omega_q - \omega_{q-4} \quad (23)$$

$$D_{T,T}^M = E(\hat{\beta}_{q,T}^M) - E(\hat{\beta}_{q-4,T}^M) = \omega_q - \omega_{q-4} \quad (24)$$

$$D_{T,T}^{All} = E(\hat{\beta}_{q,T}^{All}) - E(\hat{\beta}_{q-4,T}^{All}) = \omega_q - \omega_{q-4} \quad (25)$$

$$DD_{T,T}^{L-All} = D_{T,T}^L - D_{T,T}^{All} = 0, \quad DD_{T,T}^{M-All} = D_{T,T}^M - D_{T,T}^{All} = 0 \quad (26)$$

$$D_{N,N}^L = E(\hat{\beta}_{q,N}^L) - E(\hat{\beta}_{q-4,N}^L) = \omega_q - \omega_{q-4} \quad (27)$$

$$D_{N,N}^M = E(\hat{\beta}_{q,N}^M) - E(\hat{\beta}_{q-4,N}^M) = \omega_q - \omega_{q-4} \quad (28)$$

$$D_{N,N}^{All} = E(\hat{\beta}_{q,N}^{All}) - E(\hat{\beta}_{q-4,N}^{All}) = \omega_q - \omega_{q-4} \quad (29)$$

$$DD_{N,N}^{L-All} = D_{N,N}^L - D_{N,N}^{All} = 0, \quad DD_{N,N}^{M-All} = D_{N,N}^M - D_{N,N}^{All} = 0 \quad (30)$$

We have daily rates of return from January 1, 1977-December, 31, 2006. There are total 236,599 daily observations. Data on the daily stock rates of return are taken from Nikkei Media Marketing “*Nippon Kabushiki Nichiji Return File* (Japanese Daily Rate of Return File, 2007)” which is defined as the sum of capital gain/loss and dividend divided by previous share prices after adjusting the number of shares and the effects of the days of dividend payment. “Market return ( $R_t^m$ )” is constructed as the differences of the TOPIX divided by the same TOPIX at previous day.

———Table 2. History of the Official Price Reduction (1978-2006)

———Table 3. Firm List

———Table 4. Classification of Sample Firms

## 5. Empirical Results

### a. Individual Estimates and Overall Trend

Appendix Table reports the estimation of equation (3) for individual firms. Figure 2 exhibits the estimates of some representative firms (Sankyo, Takeda, and Yamanouchi). Figure 3 exhibits the estimates of all firms, large scale firms, medium scale firms, and OTC firms. The last four columns are the estimation by pooling 31 all firms, 7 large scale firms, 13 medium scale firms, and 11 OTC firms with assumption that coefficients are common to firms in the same category. The model accounts for the rates of return for large scale firms and medium scale firms as expected. The model, however, fails to account for small OTC firms as shown by low adjusted R-squared and insignificant coefficients. The estimates of  $\bar{\beta}_q$  for most large scale firms and medium scale firms have similar time profiles. The results indicate a significant structural change around the mid-1980s. In the earlier period (1977-1986), coefficients of  $\bar{\beta}_q$  are far higher than 1.0 in most periods and they vary widely across time periods. These coefficients have declined sharply through the period 1977-1986. The official price reductions in the early 1980s seem to have negative effects on the rates of return within the same quarterly period. Large scale firms and medium scale firms have higher  $\bar{\beta}_q$  than OTC firms (Figure 3). In the first period (1977-1986), the average coefficients of  $\bar{\beta}_q$  for large-scale and medium-scale firms had declined sharply from 1.0-2.0 to 0.5-1.0 level. As a result, the differences of  $\bar{\beta}_q$  across firm

types are significantly reduced.

### b. The Negative Effects of the Official Price Reductions

We are concerned with a question whether the price reduction has really decreased the rates of return. By adding the year-time dummy variables  $YR_t$  which takes unity when  $t=Year$ , zero otherwise.

$$r_{ht} = \sum_{h=1}^H \left( \bar{\alpha}_h + \sum_{q=1}^K (\bar{\beta}_{hq} + \tau_{ht} YR) \cdot R_t^m \right) + \varepsilon_{ht} \quad (31)$$

We examine the year effects under the assumption that the changes in the estimates associated with year time dummy variables  $\tau_{ht}$  are zero on the average. Based on the sign test and the Wilcoxon test, we test whether  $\tau_{ht}$  is positive or negative. When the official prices reductions decrease  $\beta_q$ , we will find the negative sign of the year time dummy variables. Table 5 summarizes that the expected negative effects are associated with the official price reduction for the year 1979, 1981, 1983, 1985, 1988, 1992, and 1998. On the other hand, unexpected positive effects are found for the price reduction for 1978, 1986, 1990, 2002, and 2004. These results suggest that although the negative effects are associated by the price reductions mostly in the events in the early 1980s, they have become less clear in the later periods.

### c. Difference-in-Difference Interpretation

We examine the effects of the official price reduction by equation (8).

$$r_{ht} = \alpha + \sum_{q=1}^K \beta_q^{All} R_t^m + \sum_{q=1}^K \beta_q^L R_t^m + \sum_{q=1}^K \beta_q^M R_t^m + v_{ht} \quad (8)$$

Table 6 summarizes the estimation results. When we simply plot coefficients of  $\bar{\beta}_q^{All}, \bar{\beta}_q^L, \bar{\beta}_q^M$  as in Figure 4, our results do not seem to indicate any consistent effects. As discussed in the model and data, we should identify the effects of the price reductions by the coefficients of the two cross dummy variables in equation (7).

$$r_{ht} = \alpha + \sum_{q=1}^K \left( (\bar{\beta} + \omega_t + \gamma T_{ht}) + \delta^L L_{ht} + \delta^M M_{ht} + \lambda^L L_{ht} T_{ht} + \lambda^M M_{ht} T_{ht} \right) R_t^m + v_{ht} \quad (7)$$

What we are concerned are

$$DD_{T,N}^{L-All} = D_{T,N}^L - D_{T,N}^{All} = \lambda^L, \quad DD_{T,N}^{M-All} = D_{T,N}^M - D_{T,N}^{All} = \lambda^M \quad (18)$$

$$DD_{N,T}^{L-All} = D_{N,T}^L - D_{N,T}^{All} = -\lambda^L, \quad DD_{N,T}^{M-All} = D_{N,T}^M - D_{N,T}^{All} = -\lambda^M \quad (22)$$

Based on these results, we obtain Table 6. In spite of our initial expectation, the negative effects in the period 1977-1990 are not clear except for the official price reductions in 1983, 1985, and 1990. The reforms of the price regulation in 1992 had significantly caused structural change. Directly after the introduction, positive effects are found for 1992, 1994, 1996, and 1997, the effects have declined and turned into negative around 2000. We conclude that the 1992 price reform may have positive effects on firm rates of return both for large-scale and medium-scale firms. There are no significant differences between the large scale firms and medium scale firms. Since 1998, however, the effects decline and finally the official price reductions turn to be negative in 2000, 2002, and 2004. So we conclude that the official price reductions have the negative effects. Still there are exceptions in 2006 when the positive effects are found again. Another expectation that large-scale firms with higher foreign sales ratio would be less affected than medium-scale firms with higher domestic sales ratio do not hold in our sample.

——Table 5. Sign Test and Wilcoxon Test of the Effects of Year Time Dummy on Changes in Rates of Return

——Table 6. The Effects of the Official Price Reduction

——Figure2 Coefficients of  $\beta$  of Representative Firms

——Figure3 Coefficients of  $\beta$  by Firm Group

——Figure4 Effects of the Price Reduction by Firm Size(I)

——Figure 5. Effects of the Official Price Reduction (DID inter)

## 6. Conclusion and Future Studies

This study investigated the effects of pharmaceutical price reduction on shareholders' rates of return. By using the simple market model relating the rates of return to the market rates of return, we estimated quarterly beta for individual firms. We found that the beta of the Japanese pharmaceutical firms had declined sharply around the mid-1980s and had become more stable over time periods. The differences across firms had become smaller. Thus, the Japanese pharmaceutical firms came to follow the similar time profiles in terms of quarterly beta. We also estimated an equation where the rates of return are affected by the time-specific effects in general, time-specific effects when the official price are reduced, individual specific effects associated with firm scale, and the cross effects of the official price reductions and firm scale. What we found is puzzling. We initially expected that the aggressive price reduction in 1981/6/1 (-18.6%), 1983/1/1(-4.9%), and 1984/3/1(-16.6%) may have negative effects on beta. This does not hold. Instead we found that 1992 new price regime caused structural change after 1992. Directly after the introduction, the official price reductions had positive effects instead of negative. This underscores the notion shared by executives of pharmaceutical corporations that the new price regime could increase firm value. But after series of the official price

reductions, the differences between the official prices and wholesale prices came to be very small, and firms no longer lower the wholesale prices. In year 1998, 2000, 2002, and 2004, the official price reductions had negative effects on firm value. These results do not seem to be comprehensive. Because we only have limited number of years, these results might be only artifact. In order to obtain comprehensive results, we need to compare Japanese pharmaceutical firms with foreign firms thereby identify the unobserved effects on the rates of return. They might include success/failure of R&D, introduction of new products, patent expiration, entry by generic products, and M&A.

## Reference

- MacKinlay, A. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, 35: 13-39.
- Schipper Katherine and Rex Thompson (1983), "The Impact of Merger-Related Regulations on the Shareholders of Acquiring Firms," *Journal of Accounting Research*, 21(1), Spring, 184-221.

Figure 1. Decline of the Pharmaceutical Price (wholesale prices)

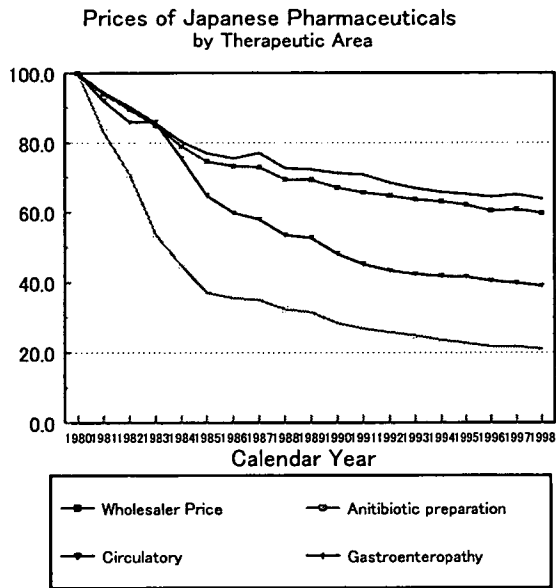
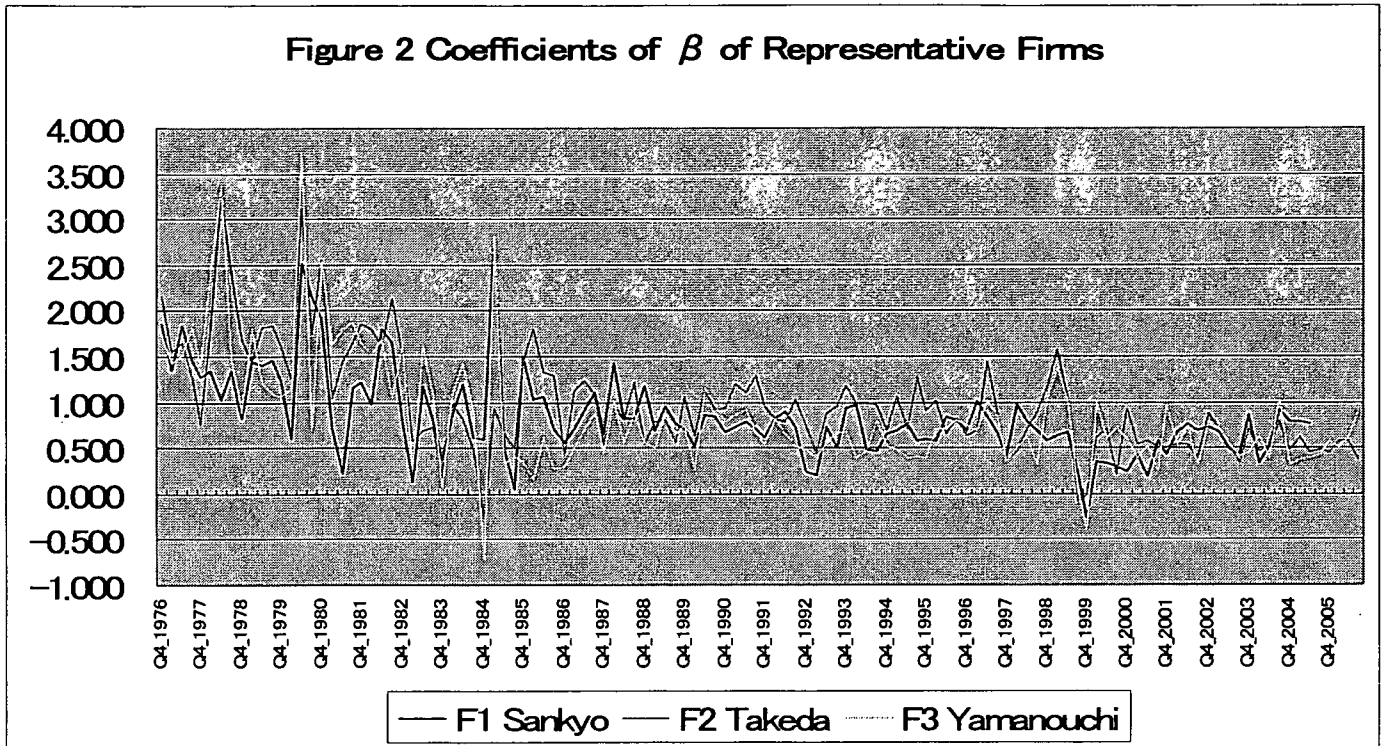
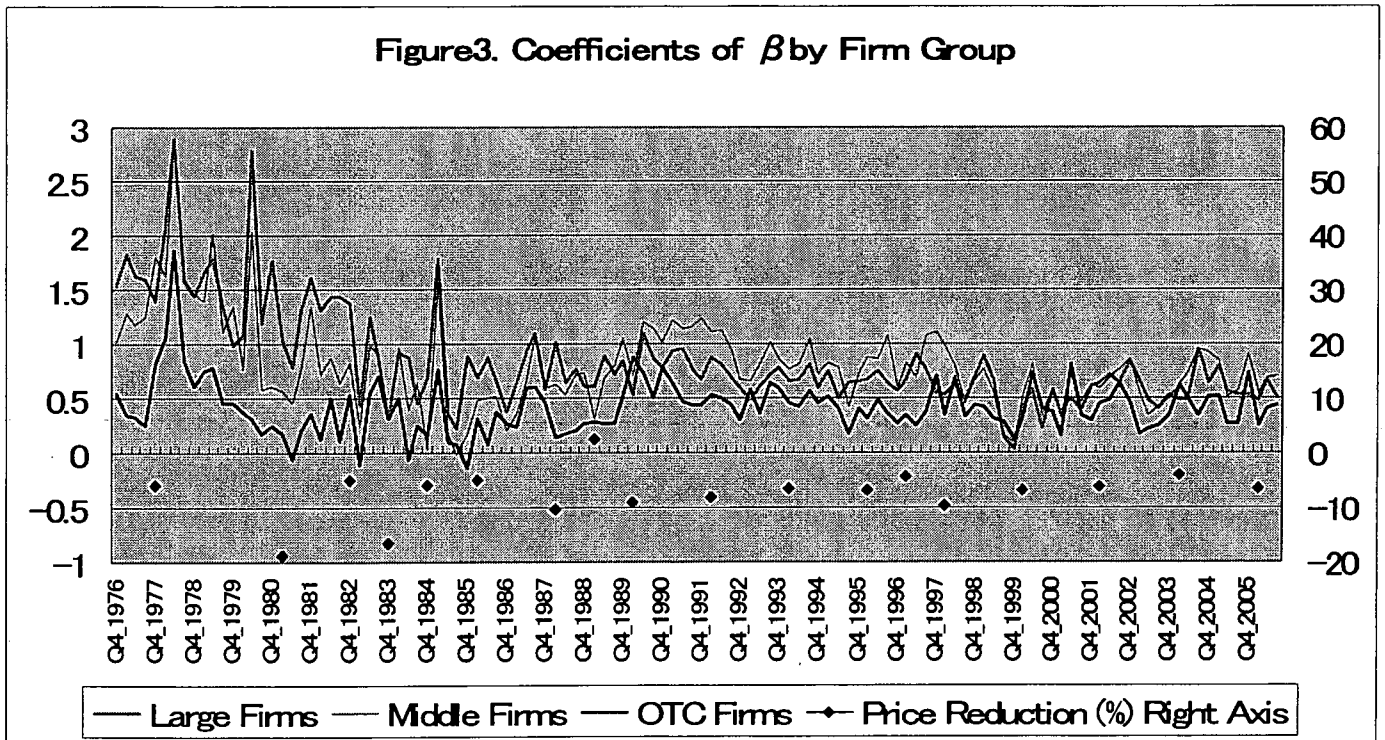


Figure2 Coefficients of  $\beta$  of Representative Firms



Note: Estimation equation (4). Estimates are found in Appendix Table.

Figure3. Coefficients of  $\beta$  by Firm Group



Note: Estimation equation (4)' under assumption coefficients are common to firms in the same sample (Sample of All firms, Large-scale Prescription Firms, and Smaller OTC Firms.)



Figure 4 Effects of the Price Reduction by Firm Size(I)

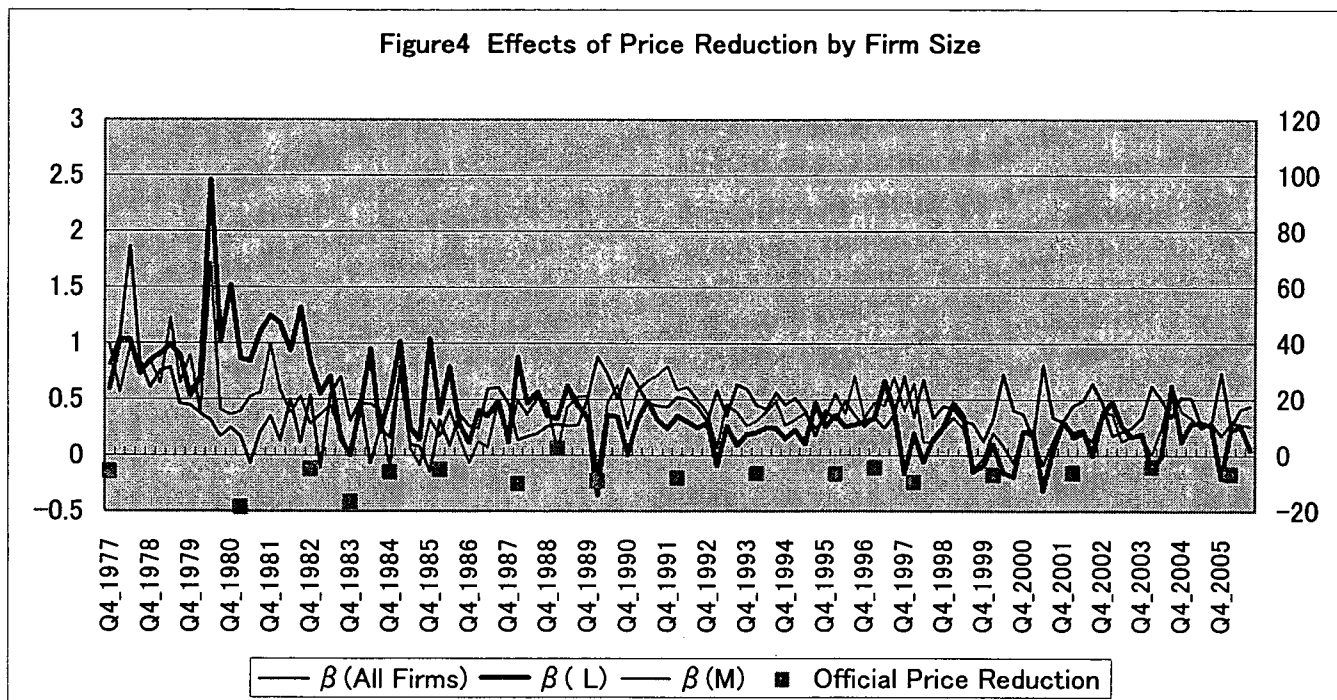
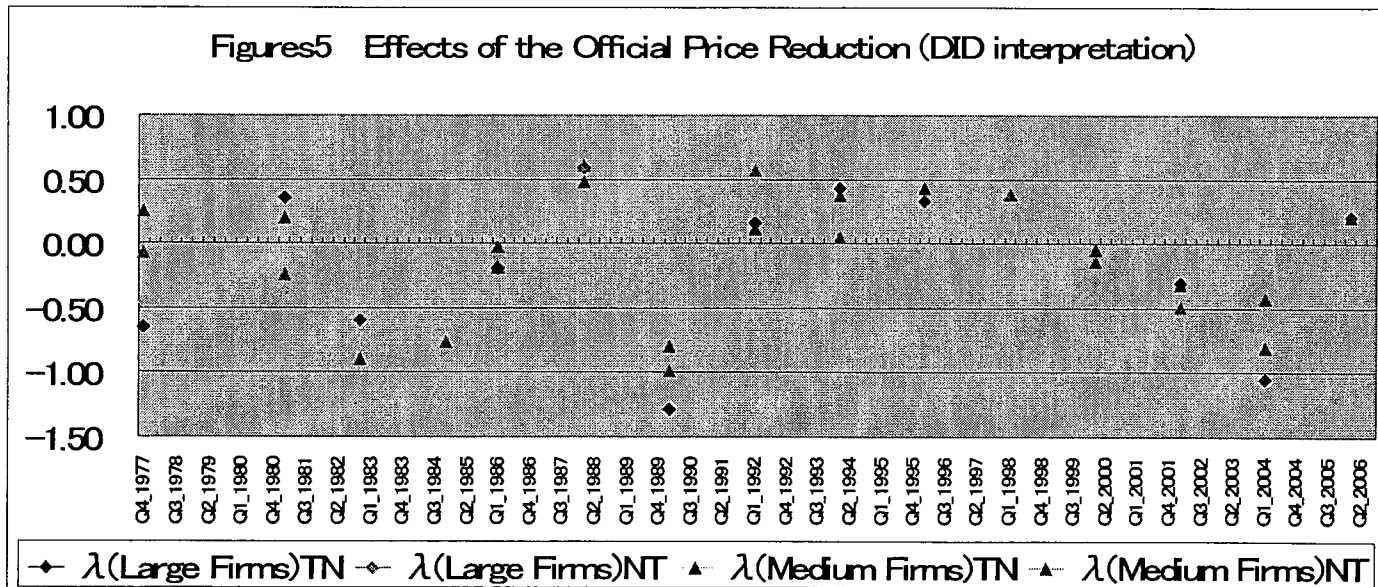


Figure 5. Effects of the Official Price Reduction (DID inter)



Figures5 Effects of the Official Price Reduction on Quarterly  $\beta$

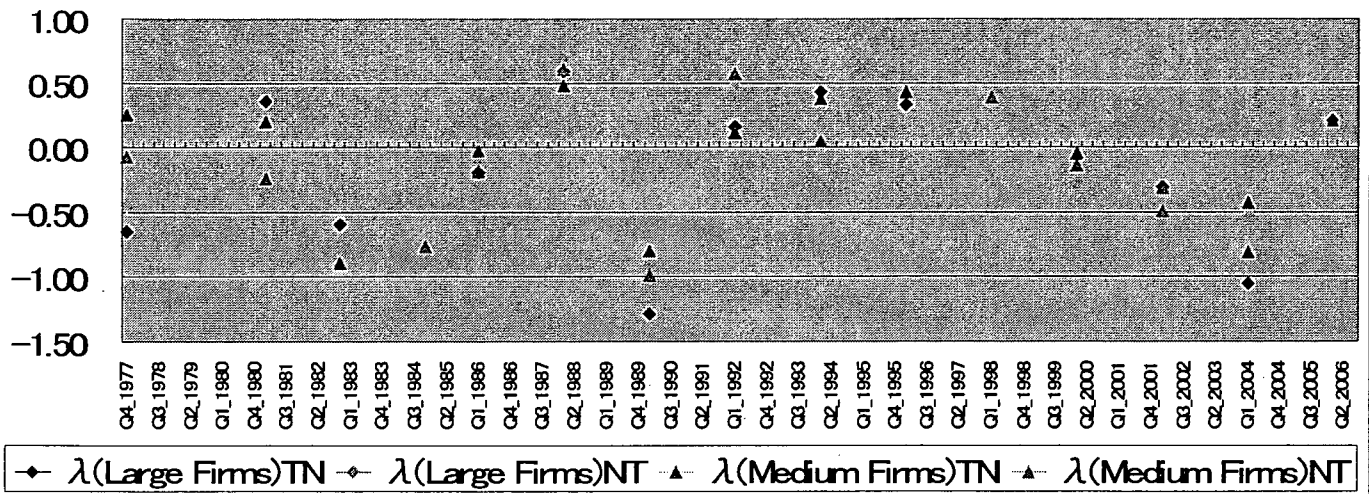


Table 1. Pharmaceutical Transactions and Prices

## Pharmaceutical Firms

↓ .....Manufacturer's Sales Price  $P^M$  (listed price)

## Wholesalers

↓ .....Wholesale Price  $P^W$  (market price)

## Hospitals/Pharmacies

↓ .....Official Price  $\bar{P}$  for the National Health Insurance Purpose

Patients                      Regulated by the government

Table 2. History of the Official Price Reduction (1978-2006)

Date of Price Reduction	Date of Survey Date	Percentage Change of Total Pharmaceutical Expenditure	Major historic changes
1977/11			(introduction of the official price system based on individual brand)
1978/2/1	1976/2	-5.8%	
1981/6/1	1978/6	-18.6%	
1983/1/1	1981/12	-4.9%	
1984/3/1	1983/4	-16.6%	
1985/3/1	1984/10	-6.0%	
1986/4/1	1985/10	-5.1%	
1988/4/1	1987/6	-10.2%	
1989/4/1		+2.4%	(increase due to newly introduced 3% consumption tax)
1990/4/1	1989/3	-9.2%	
1992/4/1	1991/6	-8.1%	(introduction of new price regulation system)
1994/4/1	1993/6	-6.6%	
1996/4/1	1995/6	-6.8%	(three consecutive years of price reduction)
1997/4/1	1996/8,10	-4.4%	(2% increase in consumption tax and new updates)
1998/4/1	1997/9	-9.7%	
2000/4/1	1999/9	-7.0%	
2002/4/1	2001/09	-6.3%	
2004/4/1	2003/9	-4.2%	
2006/4/1	2005/5,11	-6.7%	

Source: Japanese Ministry of Health and Welfare, Ministry of Health and Labor, *Yakumu Koho*, cited from Yakujinippousya, *Yakukijyunseido*, 2007.

Table 3. Firm List

Code	Name	Description
F1	Sankyo	merged with Daiichi in 2005 to form Daiichi-Sankyo
F2	Takeda	
F3	Yamanouchi	merged with Fujisawa on April 1, 2005 to form Astellas
F4	Daiichi	merged with Sankyo in 2005 to form Daiichi-Sankyo
F5	Dainippon	merged with Sumitomo Pharma in 2005 to form Dainippon-Sumitomo Pharma
F6	Shinogi	
F7	Tanabe	merged with Mitsubishi Pharmaceutical in 2007 to form Mitsubishi-Tanabe
F8	Yoshitomi	merged with Green Cross on April 1, 1998 to form Yoshitomi(new), which named later Welfide in 2000, and merged with Mitubishi Tokyo Pharma in 2001 to form Mitsubishi Pharma. This later merged with Tanabe in October 1, 2007 to form Mitsubishi Tanabe Pharma.
F9	Fujisawa	merged with Yamanouchi on April 1, 2005 to form Astellas
F10	Wakamoto	
F11	Teikoku Hormone Mfg	merged with Grelan Pharmaceutical on October 1, 2005 to form ASKA Pharmaceutical.
F12	Banyu	Taken over by Merck to become a full subsidiary and de-listed from Tokyo Stock Exchange in July, 2007
F13	Nippon Shinyaku	
F14	Biofermin	
F15	Toyama Chemical	
F16	Chugai Pharmaceutical	merged with Nippon Roche to become a full subsidiary of Roche Holding on October, 2002.
F17	Wakodo	
F18	Kaken Pharmaceutical	
F19	Green Cross	merged with Green Cross on April 1, 1998 to form Yoshitomi(new), which named later Welfide in 2000, and merged with Mitubishi Tokyo Pharma in 2001 to form Mitsubishi Pharma. This later merged with Tanabe in October 1, 2007 to form Mitsubishi Tanabe Pharma.
F20	Eisai	
F21	Morishita Jintan	
F22	Riken Vitamine	
F23	Roht	
F24	Ono	
F25	Nikkekagaku	taken over by Kowa on August 1, 2006 to Kowa
F26	Hisamitsu	
F27	Yukigosei	
F28	Tokiyotanabe	merged with Mitsubishi Chemical in 1999 to form Mitsubishi Pharma which was merged with Welfide.
F29	Mochida	
F30	Taisyō	
F31	Santen	

Table 4. Classification of Sample Firms

Table 4. Classification of Sample Firms					
	Major Products	Classification			
F1 Sankyo	Prescription Drug	Large			
F2 Takeda	Prescription Drug	Large			
F3 Yamanouchi	Prescription Drug	Large			
F4 Daiichi	Prescription Drug	Large			
F5 Dainippon	Prescription Drug	Medium			
F6 Shinogi	Prescription Drug	Medium			
F7 Tanabe	Prescription Drug	Medium			
F8 Yoshitomi/Welfide	Prescription Drug	Medium			
F9 Fujisawa	Prescription Drug	Large			
F10 Wakamoto	OTC Drug	OTC			
F11 Teikoku	OTC Drug	OTC			
F12 Banyu	Prescription Drug	Medium			
F13 Nippon	Prescription Drug	Medium			
F14 Biofermin	OTC Drug	OTC			
F15 Toyama	Prescription Drug	Medium			
F16 Chugai	Prescription Drug	Large			
F17 Wakodo	OTC Drug	OTC			
F18 Kaken	Prescription Drug	Medium			
F19 Green	Prescription Drug	Medium			
F20 Eisai	Prescription Drug	Large			
F21 Morishita	OTC Drug	OTC			
F22 Riken	OTC Drug	OTC			
F23 Roht	OTC Drug	OTC			
F24 Ono	Prescription Drug	Medium			
F25 Nikken-kagaku	OTC Drug	Medium			
F26 Hisamitsu	OTC	OTC			
F27 Yukigosei	OTC Drug	OTC			
F28 Tokyotanabe	OTC Drug	OTC			
F29 Mochida	Prescription Drug	Medium			
F30 Taisyo	Prescription Drug	Medium			
F31 Santen	OTC Drug	OTC			
Note: We classify sample firms into 7 large scale firms, 13 medium scale firms, and 11 OTC firms.					

Table 5. Sign Test and Wilcoxon Test of the Effects of Year Time Dummy on Changes in Rates of Return

Table 5: Sign Test and Wilcoxon Test of the Effects of Year Time Dummy on Changes in Rates of Return		Sign Test		Wilcoxon Test		Significance		expected/unexpected	
Year	Official Price Reduction	Sign Test	Significance	expected/unexpected	Wilcoxon Test	Significance	expected/unexpected	expected/unexpected	expected/unexpected
1978	1978/2/1	-5.80%	1.98	**	unexpected	2.57	***	unexpected	unexpected
1979			-3.05	***	expected	-3.19	***	expected	expected
1980			-1.26			1.14			
1981	1981/6/1	-18.60%	-0.90		insignificant	-2.47	***	expected	expected
1982			0.54			0.24			
1983	1983/1/1	-4.90%	-1.62		insignificant	-2.47	***	expected	expected
1984	1984/3/1	-16.60%	0.90			0.78			
1985	1985/3/1	-6.00%	-3.05	***	expected	-2.59	***	expected	expected
1986	1986/4/1	-5.10%	1.62			1.50			
1987			4.49	***		4.59	***		
1988	1988/4/1	-10.20%	-4.13	***	expected	-4.08	***	expected	expected
1989	1989/4/1	2.40%	0.54			0.45			
1990	1990/4/1	-9.20%	4.49	***	unexpected	4.57	***	unexpected	unexpected
1991			-1.26		expected	-1.45		expected	expected
1992	1992/4/1	-8.10%	-2.69	***	expected	-2.67	***	expected	expected
1993			-0.54			-0.24			
1994	1994/4/1	-6.60%	-0.90		insignificant	-1.21		insignificant	insignificant
1995			-0.54			-1.69	**		
1996	1996/4/1	-6.80%	1.62		insignificant	1.49		insignificant	insignificant
1997	1997/4/1	-4.40%	0.18			0.35			
1998	1998/4/1	-9.70%	-2.19	***	expected	-2.34	***	expected	expected
1999			-1.46			-2.03	***		
2000	2000/4/1	-7.00%	0.93			1.03			
2001			-1.30			-0.62			
2002	2002/4/1	-6.30%	3.16	***	unexpected	3.12	***	unexpected	unexpected
2003			-4.27	***		-4.44	***		
2004	2004/4/1	-4.20%	4.54	***	unexpected	4.38	***	unexpected	unexpected
2005			-0.58			-2.26	***		
2006	2006/4/1	-6.70%	0.41			0.19			

Note: One Side Test, \*\*\* significant at 1%, \*\* 5%  
 "expected" is a test indicates the negative effects associated with the price reduction, while "unexpected" indicates the positive effects when the negative sign is expected.

Table 6. The Effects of the Official Price Reduction

Quarter	Date of Price Reduction	The Effects of the Official Price Reduction														
		$\beta$ of All Firms	$\beta$ of Large Scale Firms	$\beta$ of Medium Scale Firms	$\beta$ (All Firms) $\beta$ (All Firms)	$\beta$ (L) $\beta$ (M)	$\beta$ (L) $\beta$ (M)	Changes in $\beta$ of Large Scale Firms	Changes in $\beta$ of Medium Scale Firms	Difference between Large-All Firms	Difference between Medium-All Firms	Effects of the Official Price Reduction	Effects of the Official Price Reduction	Effects of the Official Price Reduction	Effects of the Official Price Reduction	Effects of the Official Price Reduction
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	IN	NT	IN	NT	IN	NT
Q4 1977	1978/2/1	-5.8	0.806	0.592	0.263	-0.392	0.518	-0.855	0.255	-0.454	-0.655	0.255	-0.454	-0.655	0.255	-0.454
Q1 1978			1.063	0.563	0.724	-0.456	-0.385	-1.108	-1.108	-1.180	-0.855	-1.108	-1.180	-0.855	-1.108	-1.180
Q2 1978			1.965	1.031	0.962	1.534	-0.267	0.123	-1.410	-1.801	-1.801	-1.410	-1.801	-1.410	-1.801	-1.410
Q3 1978			0.843	0.730	0.763	0.593	-0.617	-0.231	-1.208	-1.208	-0.823	-0.823	-1.208	-0.823	-1.208	-0.823
Q4 1978			0.802	0.643	0.653	-0.203	0.251	-0.133	0.454	0.454	0.071	0.071	0.454	0.071	0.454	0.071
Q1 1979			0.755	0.907	0.643	-0.308	-0.126	0.060	0.183	0.183	0.368	0.368	0.183	0.368	0.183	0.368
Q2 1979			0.766	0.988	1.230	-1.080	-0.042	0.268	1.037	1.037	0.268	0.268	1.037	0.268	1.037	0.268
Q3 1979			0.458	0.891	0.650	-0.385	0.161	-0.114	0.546	0.546	0.271	0.271	0.546	0.271	0.546	0.271
Q4 1979			0.447	0.894	0.532	-0.155	0.310	0.041	-0.155	0.041	0.196	0.196	-0.155	0.041	0.196	0.041
Q1 1980			0.372	0.700	0.383	-0.384	-0.207	-0.250	0.176	0.176	0.194	0.194	0.176	0.194	0.176	0.194
Q2 1980			0.318	2.457	1.719	-0.468	1.468	0.469	1.937	1.937	0.957	0.957	1.937	0.957	1.937	0.957
Q3 1980			0.169	0.102	0.408	-0.288	0.121	-0.242	0.410	0.410	0.047	0.047	0.410	0.047	0.410	0.047
Q4 1980			0.248	1.514	0.365	-0.198	0.962	-0.529	1.181	1.181	-0.330	-0.330	1.181	-0.330	1.181	-0.330
Q1 1981	1981/6/1	-18.6	0.173	0.860	0.392	-0.198	0.359	0.160	-0.001	0.160	0.160	0.160	0.160	0.160	0.160	0.160
Q2 1981			-0.070	0.844	0.527	-0.387	-0.183	-1.192	-1.192	-1.226	-0.805	-0.805	-1.226	-0.805	-1.226	-0.805
Q3 1981			0.558	0.210	1.105	0.041	0.084	0.152	0.063	0.063	0.111	0.111	0.063	0.111	0.063	0.111
Q4 1981			0.358	1.248	0.884	0.107	-0.266	0.628	0.628	-0.374	-0.374	0.628	-0.374	0.628	-0.374	0.628
Q1 1982			0.130	0.706	0.381	-0.042	0.396	0.194	0.396	0.396	0.237	0.237	0.396	0.237	0.396	0.237
Q2 1982			0.489	0.936	0.381	0.589	0.093	-0.147	-0.476	-0.476	-0.716	-0.716	-0.476	-0.716	-0.476	-0.716
Q3 1982			0.114	1.318	0.526	-0.096	0.213	-0.094	0.310	0.310	0.063	0.063	0.310	0.063	0.310	0.063
Q4 1982	1983/1/1	-4.9	0.245	0.840	0.282	-0.408	-0.711	-0.591	-0.591	-0.894	-0.591	-0.894	-0.591	-0.894	-0.591	-0.894
Q1 1983			-0.111	0.553	0.367	-0.242	0.041	-0.219	-0.219	-0.382	-0.382	0.023	0.023	-0.382	0.023	-0.382
Q2 1983			0.540	0.707	0.450	0.041	-0.228	0.070	-0.228	-0.228	0.029	0.029	-0.228	0.029	-0.228	0.029
Q3 1983			0.703	0.153	0.200	0.589	-1.166	-0.325	-1.755	-1.755	-0.915	-0.915	-1.755	-0.915	-1.755	-0.915
Q4 1983	1984/3/1	-18.6	0.312	0.065	0.068	-0.226	-0.934	-0.275	-0.726	-0.726	-0.048	-0.048	-0.726	-0.048	-0.726	-0.048
Q1 1984			0.495	0.433	0.469	0.607	-0.120	0.102	0.241	0.241	0.848	0.848	0.241	0.848	0.241	0.848
Q2 1984			-0.068	0.848	0.460	-0.607	0.241	0.010	0.848	0.848	0.617	0.617	0.848	0.617	0.848	0.617
Q3 1984			0.245	0.211	0.400	-0.458	0.058	0.200	0.516	0.516	0.658	0.658	0.516	0.658	0.516	0.658
Q4 1984	1985/3/1	-6	0.159	0.522	-0.130	-0.153	0.516	-0.138	-0.138	-0.619	-0.619	0.015	0.015	-0.619	0.015	-0.619
Q1 1985			0.760	1.017	0.796	0.265	0.564	0.927	0.319	0.319	0.062	0.062	0.319	0.062	0.319	0.062
Q2 1985			0.101	0.254	0.093	0.168	-0.693	-0.397	-0.862	-0.862	-0.965	-0.965	-0.862	-0.965	-0.862	-0.965
Q3 1985			0.077	1.398	-0.088	-0.168	-0.072	-0.489	0.097	0.097	0.761	0.761	0.097	0.761	0.097	0.761
Q4 1985			-0.147	1.035	0.323	-0.306	0.514	0.455	0.819	0.819	0.184	0.184	0.819	0.184	0.819	0.184
Q1 1986	1986/4/1	-5.1	0.316	0.376	0.168	-0.444	-0.640	-0.628	-0.186	-0.186	-0.186	-0.186	-0.186	-0.186	-0.186	-0.186
Q2 1986			0.083	0.792	0.410	-0.018	0.537	0.347	0.555	0.555	0.364	0.364	0.555	0.364	0.555	0.364
Q3 1986			0.370	0.280	0.151	0.293	0.141	0.239	0.141	-0.152	-0.152	-0.053	-0.053	-0.152	-0.053	-0.152
Q4 1986			0.264	0.113	-0.087	0.411	-0.823	-0.892	-1.334	-1.334	-0.803	-0.803	-1.334	-0.803	-1.334	-0.803
Q1 1987			0.242	0.400	0.124	-0.074	0.023	-0.044	0.068	0.068	0.030	0.030	0.068	0.030	0.068	0.030
Q2 1987			0.892	0.351	0.073	0.508	-0.441	-0.337	-0.950	-0.950	-0.846	-0.846	-0.950	-0.846	-0.950	-0.846
Q3 1987			0.806	0.483	0.479	0.236	0.203	0.328	0.034	0.034	0.091	0.091	0.034	0.091	0.034	0.091
Q4 1987			0.455	0.116	0.138	0.192	0.003	0.205	-0.188	-0.188	0.013	0.013	-0.188	0.013	-0.188	0.013
Q1 1988	1988/4/1	-10.2	0.136	0.878	0.498	-0.106	0.479	0.375	0.585	0.585	0.478	0.478	0.585	0.478	0.585	0.478
Q2 1988			0.466	0.170	0.466	-0.423	0.117	0.288	0.288	0.540	0.540	0.540	0.540	0.540	0.540	0.540
Q3 1988			0.197	0.566	0.519	-0.410	0.683	0.659	0.449	0.449	0.492	0.492	0.449	0.492	0.449	0.492
Q4 1988			0.263	0.354	0.467	-0.183	0.329	0.329	0.431	0.431	0.522	0.522	0.431	0.522	0.431	0.522





**Table 6 The Effects of the Official Price Reduction (continued)**

Quarter	Date of Price Reduction	Reduction(%)	Table 6 The Effects of the Official Price Reduction (continued)													
			$\beta$ of All Firms	$\beta$ of Large Scale Firms	$\beta$ of Medium Scale Firms	$\beta$ of All Firms	$\beta$ of Large Scale Firms	Changes in $\beta$ of Large Scale Firms	Changes in $\beta$ of Medium Scale Firms	Difference between Large-All Firms	Difference between Medium-All Firms	Effects of the Official Price Reduction	Effects without the Official Price Reduction			
			(1)	(2)	(3)	(4)	(5)	(6)	(7)=(5)-(4)	(8)=(6)-(4)	$\lambda$ (Large Firms)	II or NN	Effects of the Official Price Reduction	$\lambda$ (Medium Firms)	NI	Effects without the Official Price Reduction
Q1 2000	2000/4/1	-7	0.325	0.088	0.205	-0.084	-0.369	-0.137	-0.274	-0.042	-0.274	-0.274	-0.042	-0.274	-0.137	-0.572
Q2 2000			0.730	-0.155	0.089	0.421	-0.510	-0.151	-0.831	-0.572	-0.831	-0.572	-0.831	-0.572	-0.059	-0.010
Q3 2000			0.404	-0.193	-0.068	0.119	-0.045	0.060	-0.164	-0.059	-0.164	-0.059	-0.164	-0.059	-0.057	-0.254
Q4 2000			0.371	0.213	0.207	0.246	0.303	0.235	0.057	-0.010	0.276	0.137	0.057	0.137	0.282	0.192
Q1 2001			0.157	0.206	0.173	-0.168	0.06	-0.092	0.276	0.276	-0.236	-0.254	-0.236	-0.254	0.304	0.282
Q2 2001			0.609	-0.313	-0.067	0.079	-0.157	-0.175	-0.236	-0.254	0.304	0.282	0.304	0.282	0.154	0.192
Q3 2001			0.340	0.046	0.130	-0.065	0.239	0.196	0.154	0.192	0.154	0.192	0.154	0.192	0.154	0.192
Q4 2001			0.309	0.300	0.321	-0.068	0.067	0.114	-0.024	-0.303	-0.303	-0.303	-0.313	-0.313	-0.496	0.599
Q1 2002	2002/4/1	-6.3	0.446	0.192	0.149	0.289	-0.014	-0.024	-0.320	-0.024	-0.320	-0.309	-0.313	-0.313	-0.496	0.599
Q2 2002			0.488	0.226	0.192	0.192	0.538	0.278	0.538	0.538	0.538	0.538	0.538	0.538	0.538	0.599
Q3 2002			0.645	-0.003	0.125	0.305	-0.049	-0.005	-0.320	-0.005	-0.320	-0.310	-0.310	-0.310	-0.496	-0.087
Q4 2002			0.468	0.368	0.368	0.165	0.066	0.078	-0.088	-0.088	0.496	0.496	-0.088	-0.088	0.496	0.207
Q1 2003			0.174	0.492	0.373	-0.272	0.280	0.224	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.444
Q2 2003			0.214	0.287	0.172	-0.275	0.041	-0.066	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.444
Q3 2003			0.248	0.166	0.172	-0.397	0.169	0.047	0.586	0.586	0.586	0.586	0.586	0.586	0.586	0.444
Q4 2003			0.337	0.192	0.192	-0.131	-0.176	-0.232	-0.045	-0.045	-0.045	-0.045	-0.045	-0.045	-0.045	-0.101
Q1 2004	2004/4/1	-4.2	0.618	-0.130	0.008	0.444	-0.612	-0.364	-1.057	-1.057	-1.057	-1.057	-0.809	-0.809	-0.430	-0.171
Q2 2004			0.500	-0.010	0.239	0.286	-0.277	0.114	0.286	0.286	0.286	0.286	0.286	0.286	0.286	0.353
Q3 2004			0.398	0.618	0.615	0.091	0.452	0.444	0.361	0.361	0.361	0.361	0.361	0.361	0.361	0.444
Q4 2004			0.321	0.122	0.395	0.184	-0.071	0.228	-0.255	-0.255	-0.255	-0.255	-0.255	-0.255	-0.255	0.044
Q1 2005			0.515	0.281	0.395	-0.103	0.411	0.327	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.430
Q2 2005			0.273	0.283	0.241	-0.227	0.303	0.003	0.228	0.228	0.228	0.228	0.228	0.228	0.228	0.428
Q3 2005			0.272	0.265	0.298	-0.067	-0.353	-0.318	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286	-0.231
Q4 2005			0.735	-0.203	0.174	0.214	-0.325	-0.220	-0.538	-0.538	-0.538	-0.538	-0.538	-0.538	-0.538	-0.538
Q1 2006	2006/4/1	-8.7	0.255	0.228	0.287	-0.260	-0.065	-0.049	0.205	0.211	0.211	0.211	0.211	0.211	0.211	-0.101
Q2 2006			0.411	0.255	0.279	0.138	-0.038	0.038	-0.177	-0.177	-0.177	-0.177	-0.177	-0.177	-0.177	-0.101
Q3 2006			0.442	0.062	0.259	0.170	-0.213	-0.039	-0.363	-0.363	-0.363	-0.363	-0.363	-0.363	-0.363	-0.208

Appendix Table. Quarterly Beta

Adjusted R-squared		Price Reduction (%)											
Variable	Coeff	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
1. Constant	0.033												
2. Q4.1976.RM	1.854	0.163	0.070	0.182	0.140	0.170	0.232	0.120	0.134	0.158	0.073	0.052	0.124
3. Q1.1977.RM	1.351	0.056	0.070	0.070	0.069	0.065	0.053	0.059	0.059	0.047	0.056	0.056	0.050
4. Q2.1977.RM	1.845	1.926	1.984	1.984	2.041	2.568	2.150	2.287	2.344	2.125	2.597	2.518	2.291
5. Q3.1977.RM	1.480	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
6. Q4.1977.RM	1.277	13.700	13.700	13.700	11.700	14.900	20.700	9.900	11.100	12.800	6.100	4.600	10.200
7. Q1.1978.RM	1.343	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
8. Q2.1978.RM	1.022	14.514	14.514	14.514	11.700	14.900	20.700	9.900	11.100	12.800	6.100	4.600	10.200
9. Q3.1978.RM	1.350	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
10. Q4.1978.RM	0.917	14.514	14.514	14.514	11.700	14.900	20.700	9.900	11.100	12.800	6.100	4.600	10.200
11. Q1.1979.RM	1.446	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
12. Q2.1979.RM	1.411	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
13. Q3.1979.RM	1.470	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
14. Q4.1979.RM	1.233	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
15. Q1.1980.RM	0.988	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
16. Q2.1980.RM	2.520	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
17. Q3.1980.RM	2.151	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
18. Q4.1980.RM	1.916	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
19. Q1.1981.RM	0.713	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
20. Q2.1981.RM	0.224	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
21. Q3.1981.RM	1.164	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
22. Q4.1981.RM	1.223	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
23. Q1.1982.RM	0.969	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
24. Q2.1982.RM	1.804	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
25. Q3.1982.RM	1.618	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
26. Q4.1982.RM	1.656	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
27. Q1.1983.RM	0.797	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
28. Q2.1983.RM	0.135	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
29. Q3.1983.RM	1.179	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
30. Q4.1983.RM	0.365	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
31. Q1.1984.RM	0.854	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
32. Q2.1984.RM	1.202	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
33. Q3.1984.RM	0.826	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
34. Q4.1984.RM	0.485	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
35. Q1.1985.RM	0.611	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
36. Q2.1985.RM	2.801	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
37. Q3.1985.RM	0.489	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
38. Q4.1985.RM	0.052	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
39. Q1.1986.RM	1.505	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
40. Q2.1986.RM	1.039	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
41. Q3.1986.RM	1.077	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
42. Q4.1986.RM	0.705	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
43. Q1.1987.RM	0.553	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
44. Q2.1987.RM	0.712	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
45. Q3.1987.RM	0.919	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
46. Q4.1987.RM	1.111	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
47. Q1.1988.RM	0.649	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
48. Q2.1988.RM	1.422	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
49. Q3.1988.RM	0.817	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
50. Q4.1988.RM	0.820	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
51. Q1.1989.RM	1.185	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144
51. Q1.1989.RM	0.683	1.555	1.782	1.892	1.892	2.346	1.984	2.145	2.180	1.955	2.500	2.452	2.144

Appendix Table Quarterly Beta (Continued)

Price Reduction (%)	F1 Sankyo	F2 Takeda	F3 Yamano/uchi	F4 Daiichi	F5 Daihiteppan	F6 Shinogi	F7 Tanabe	F8 Yoshimoto/PS	F9 Fujiwara	F10 Wakamoto	F11 Teikoku	F12 Banyu
-0.6	0.935	0.803	0.877	1.128	0.732	0.906	0.548	1.164	0.577	0.398	-0.811	0.770
	0.780	0.595	0.656	0.582	1.135	0.524	0.329	0.480	0.893	0.132	0.845	0.644
	0.706	1.072	0.739	0.771	1.094	1.064	0.929	1.057	0.555	-0.018	0.561	1.293
-8.2	0.527	0.641	0.259	0.518	0.568	-0.023	0.752	0.488	0.890	0.882	0.865	0.870
	0.852	1.147	1.145	1.093	1.199	1.064	0.936	1.407	1.083	0.982	1.122	0.895
	0.836	0.873	0.809	0.732	0.981	0.981	0.981	1.142	0.982	0.739	0.540	0.834
	0.671	0.932	0.787	0.788	0.854	0.921	0.950	0.777	0.923	2.231	0.615	0.655
	0.831	1.199	0.854	0.651	1.252	1.280	0.932	1.314	1.989	0.834	0.318	0.975
	0.778	0.813	0.813	0.877	1.189	1.189	0.892	0.831	0.734	0.734	0.405	1.444
	0.705	1.288	0.657	0.706	1.828	1.143	0.954	0.677	0.607	0.605	0.845	0.740
	0.608	0.847	0.542	0.706	1.802	1.226	1.179	1.034	0.649	1.110	0.598	1.083
-8.1	0.822	0.822	0.822	0.822	1.407	1.022	1.010	1.072	0.782	1.063	0.868	1.244
	0.884	0.785	0.681	0.676	1.507	1.157	0.972	1.006	1.086	1.040	0.600	0.828
	0.722	1.034	0.518	0.587	1.945	1.089	0.983	1.005	0.929	1.012	0.601	0.878
	0.243	0.741	0.496	0.747	1.761	0.893	0.907	0.360	0.555	0.587	0.723	0.603
	0.201	0.439	0.382	0.594	0.887	0.735	0.733	0.854	0.545	0.833	0.925	0.595
	0.738	0.876	0.382	0.922	1.005	0.847	0.755	0.868	0.548	0.587	0.282	1.059
	0.505	0.955	0.681	0.922	1.075	1.308	0.959	1.145	0.868	0.859	1.005	1.373
	0.928	1.174	0.675	0.560	0.935	1.590	0.766	0.711	0.935	0.842	0.895	0.873
	0.973	0.885	0.384	0.637	1.120	1.340	0.460	0.870	0.735	0.815	0.227	0.929
	0.482	0.998	0.810	0.450	1.287	0.765	0.968	0.808	0.880	0.685	0.224	0.491
	0.463	0.897	0.810	0.678	1.132	1.425	1.198	1.319	0.985	0.790	0.119	0.995
	0.695	0.690	0.517	0.658	1.037	1.245	0.771	0.671	0.911	0.911	0.492	0.892
	0.770	1.073	0.482	0.811	1.796	1.220	1.010	0.642	0.688	1.010	0.272	0.190
	0.584	1.274	0.409	0.472	1.598	1.287	0.892	0.811	0.685	0.412	0.267	0.372
	0.597	0.844	0.398	0.358	1.068	1.108	1.002	0.449	1.219	1.003	0.364	0.895
-0.8	0.561	1.012	0.704	0.476	1.510	1.512	1.048	0.663	0.881	1.003	0.051	0.977
	0.842	0.647	0.701	0.897	1.241	1.512	0.487	1.001	0.881	1.003	0.364	0.895
	0.811	0.828	0.812	0.638	1.564	1.713	0.852	0.808	0.444	0.347	0.818	0.878
	0.685	0.642	0.740	0.188	1.075	0.987	0.290	0.418	0.939	1.012	0.051	0.232
-4.4	1.010	0.688	0.696	0.686	0.877	0.926	0.877	0.927	0.854	1.012	0.189	0.814
	0.850	0.435	1.011	0.877	1.495	1.439	0.177	0.500	0.854	0.178	0.151	0.540
	0.682	0.862	0.849	0.775	1.484	1.832	0.813	1.042	0.885	0.583	0.463	0.862
	0.418	0.364	0.345	0.423	2.010	2.010	0.758	1.224	0.670	0.870	0.338	0.595
-9.7	0.980	0.469	0.510	0.620	1.635	1.174	0.729	1.040	0.294	0.085	-0.026	0.401
	0.781	0.707	0.626	0.434	1.069	0.844	0.823	0.558	0.384	1.256	0.423	0.117
	0.688	0.878	0.316	0.228	0.818	0.844	0.434	0.057	0.340	0.554	0.289	0.377
	0.577	1.157	1.038	0.285	1.670	0.848	0.553	0.571	0.951	0.558	0.091	0.411
	0.638	1.583	1.366	0.212	1.811	0.712	0.500	0.446	0.488	0.354	0.110	0.110
	0.684	1.023	1.012	0.195	0.938	0.938	0.338	0.931	0.734	-0.050	0.605	0.537
	0.226	-0.065	0.039	-0.027	0.004	0.354	0.296	0.313	0.333	0.085	0.170	0.193
	-0.272	-0.016	-0.406	-0.224	-0.009	-0.173	-0.146	0.338	1.196	0.413	0.330	-0.124
-7	0.360	0.611	0.998	0.058	0.609	0.268	0.300	0.851	0.480	0.565	0.390	0.388
	0.327	0.706	0.592	0.588	0.559	0.930	0.766	0.021	0.673	0.872	0.417	0.650
	0.293	0.188	0.737	-0.141	0.715	0.459	0.127	0.435	-0.193	0.515	0.732	0.160
	0.244	0.835	0.600	0.690	0.938	1.225	0.450	0.864	0.155	0.155	0.550	0.222
	0.425	0.850	0.394	0.468	0.245	1.147	-0.292	0.491	0.218	0.185	-0.033	0.304
	0.177	0.580	0.518	0.788	1.103	1.028	0.440	0.765	0.812	0.832	0.295	0.925
	0.572	0.486	0.248	0.440	0.611	0.880	0.405	0.283	0.329	0.485	0.248	0.248
	0.437	0.512	0.946	0.614	0.538	0.831	0.430	0.681	0.572	0.332	0.662	0.482
-6.3	0.688	0.544	0.533	0.607	0.720	0.831	0.405	0.704	1.048	0.395	0.421	0.087
	0.765	0.536	0.733	0.828	0.852	0.843	0.399	0.742	0.778	0.638	0.677	0.787
	0.685	0.394	0.322	0.788	0.760	0.843	0.550	1.311	0.727	0.718	0.657	0.458
	0.728	0.878	0.763	0.721	0.681	0.856	0.814	0.988	0.678	0.681	0.156	0.870
	0.477	0.545	0.539	0.563	0.243	0.508	0.457	0.903	0.931	0.363	0.384	-0.081
	0.428	0.327	0.419	0.478	0.641	0.759	0.428	0.523	0.320	0.220	0.234	0.182
	0.859	0.465	0.441	0.595	0.769	0.610	0.077	0.908	0.211	0.185	0.300	0.300
-4.2	0.338	0.415	0.627	0.595	0.610	0.704	0.704	0.358	0.625	0.649	0.713	0.842
	0.518	0.519	0.388	0.478	0.524	0.685	0.763	1.360	0.459	0.459	0.474	0.474
	0.968	0.784	0.938	1.001	1.003	1.456	0.606	1.422	0.462	0.462	0.873	0.873
	0.788	0.482	0.320	0.864	0.739	1.027	1.027	1.350	0.462	0.846	0.846	0.846
	0.791	0.012	0.372	1.076	0.850	0.685	0.659	1.133	4.066	0.582	0.954	0.954
	0.771	0.447	0.397	0.710	0.517	0.326	0.326	0.975	0.699	0.699	0.450	0.450
	0.484	0.484	0.432	0.168	0.168	0.201	0.378	0.783	0.783	0.454	0.320	0.320
	0.448	0.448	0.458	0.570	0.681	0.681	0.886	0.681	0.886	0.577	1.111	1.111
	0.374	0.374	0.487	0.827	0.520	0.520	0.627	0.627	0.627	0.203	0.430	0.430
	0.588	0.588	0.616	0.777	0.391	0.777	0.627	0.777	0.627	0.582	0.582	0.582
	0.963	0.963	0.907	0.442	0.346	0.442	0.827	0.442	0.442	0.419	0.308	0.308

Appendix Table Quarterly Beta (Continued)

Appendix Table Quarterly Beta (Continued)		Price Reduction (%)											
Variable	F13 Nippon	F14 Blaferein	F15 Toyama	F16 Chugai	F17 Daiichi	F18 Kaken	F19 Otsu	F20 Eisai	F21 Morishita	F22 Nigen	F23 Rohto	F24 Ono	F25 Nikkormagaki
	Coef	Coef	Coef	Coef	Coef	Coef	Coef	Coef	Coef	Coef	Coef	Coef	Coef
Adjusted R-squared	0.110	0.038	0.174	0.141	0.010	0.112	0.189	0.138	0.026	0.017	0.117	0.105	0.091
Mean of Dependent Variables	0.055	0.066	0.043	0.056	0.050	0.069	0.038	0.071	0.044	0.052	0.056	0.062	0.054
Std Error of Dependent Variables	2.420	2.462	2.527	2.061	2.283	2.993	2.455	2.072	2.822	1.986	2.161	2.459	2.711
Standard Error of Estimate	2.322	2.373	2.296	1.910	2.226	2.810	2.211	1.923	2.785	1.980	2.326	2.426	2.585
Regression F	9.000	3.600	14.900	11.700	1.600	9.200	16.300	11.400	2.700	2.100	9.600	8.600	7.400
Log Likelihood	-17.655	-17.825	-17.567	-16.124	-15.289	-18.150	-16.300	-16.176	-18.079	-18.405	-16.605	-17.869	-18.239
Durbin-Watson Statistic	2.082	2.028	2.081	2.146	1.847	2.028	2.113	2.143	1.782	1.874	2.190	2.062	2.103
1. Constant	0.061	0.072	0.038	0.048	0.048	0.068	0.024	0.047	0.051	0.052	0.056	0.082	0.050
2. Q1.1978.RM	0.029	0.261	0.388	0.711	-0.364	1.088	2.308	1.406	2.421	0.815	-0.321	0.181	1.559
3. Q1.1977.RM	1.153	-0.147	1.866	2.160	0.280	2.252	1.944	2.179	-0.382	0.675	0.695	0.669	1.195
4. Q2.1977.RM	0.903	0.426	1.829	1.638	-0.034	0.728	2.418	1.404	0.027	0.106	0.902	0.902	-0.755
5. Q3.1977.RM	0.113	0.464	1.951	1.872	-0.056	1.113	1.901	1.469	0.196	0.145	0.722	0.722	0.093
6. Q4.1977.RM	0.522	1.668	2.180	1.168	-0.219	3.957	3.323	1.702	0.784	0.075	0.848	0.878	0.739
7. Q1.1978.RM	1.764	-0.009	1.118	1.700	0.479	-0.776	1.890	2.731	0.330	0.938	0.938	1.874	1.203
8. Q2.1978.RM	4.406	1.365	2.912	1.693	0.187	2.271	2.365	3.588	1.818	1.691	0.546	5.537	3.204
9. Q3.1978.RM	1.728	2.049	1.937	0.995	0.451	2.147	1.946	1.827	0.461	0.888	0.390	1.240	0.731
10. Q4.1978.RM	0.135	-0.135	1.555	0.903	0.143	1.850	0.795	2.405	-0.563	0.308	1.284	3.290	0.899
11. Q1.1979.RM	1.894	-0.363	2.042	1.589	-0.158	1.227	1.549	1.814	-0.503	0.082	0.811	0.987	2.741
12. Q2.1979.RM	2.447	0.457	1.684	1.550	0.511	3.425	4.047	3.098	-0.413	0.154	1.398	2.294	0.915
13. Q3.1979.RM	1.051	0.175	1.811	1.204	0.192	1.599	1.502	1.385	-0.058	0.022	0.561	1.736	0.971
14. Q4.1979.RM	2.595	0.255	1.278	0.835	0.419	1.977	1.087	1.440	0.332	0.051	0.401	1.866	-0.308
15. Q1.1980.RM	1.144	-0.319	1.146	1.111	-0.192	1.751	0.928	1.595	-0.044	0.016	0.238	1.171	1.185
16. Q2.1980.RM	2.483	-0.057	0.433	2.387	-0.104	1.983	3.235	3.319	0.389	-0.273	0.605	2.290	1.639
17. Q3.1980.RM	0.195	0.517	0.493	1.917	0.634	2.480	1.183	1.368	-0.286	-0.138	1.073	1.073	-0.348
18. Q4.1980.RM	0.194	-0.060	0.495	0.460	0.132	-0.139	1.987	2.570	-0.664	-0.118	0.908	0.211	1.127
19. Q1.1981.RM	0.219	0.049	0.844	0.654	-0.067	0.006	1.082	0.842	0.222	0.009	0.652	0.652	0.008
20. Q2.1981.RM	0.289	-0.055	0.065	0.551	0.038	2.085	0.727	0.753	-0.070	0.013	0.180	0.753	-0.326
21. Q3.1981.RM	1.084	0.044	1.539	1.366	0.078	0.045	0.841	0.636	-0.149	-0.013	0.687	0.729	0.244
22. Q4.1981.RM	1.680	0.057	1.630	1.721	0.340	2.112	1.745	1.378	-0.084	-0.167	0.887	1.887	0.936
23. Q1.1982.RM	0.445	1.357	1.275	0.797	-0.200	-0.937	0.989	1.082	-1.025	0.112	-0.317	0.644	0.071
24. Q2.1982.RM	0.754	0.143	0.868	1.357	0.374	0.834	1.800	0.834	0.142	0.142	0.182	1.008	0.381
25. Q3.1982.RM	1.237	0.010	1.324	1.324	-0.047	-0.164	1.034	1.057	0.043	0.059	0.120	-0.048	0.953
26. Q4.1982.RM	0.988	0.088	0.096	1.424	0.453	1.069	1.242	2.125	-0.367	0.221	0.847	0.716	0.960
27. Q1.1983.RM	0.198	-1.162	0.020	0.914	-0.239	0.929	0.862	1.332	-0.283	0.159	-0.678	-1.112	0.757
28. Q2.1983.RM	1.795	-0.270	0.573	2.121	-0.151	1.590	1.450	0.470	0.363	0.160	0.615	0.956	1.018
29. Q3.1983.RM	0.974	-0.336	0.171	0.895	0.187	1.176	0.064	0.252	0.463	0.466	1.511	0.764	1.408
30. Q4.1983.RM	-0.112	0.560	-0.034	-0.453	-0.316	-0.072	0.601	1.000	0.146	1.727	-0.189	1.899	0.715
31. Q1.1984.RM	1.309	0.073	0.492	1.286	0.093	1.808	0.911	0.341	-0.093	0.041	0.552	1.587	0.467
32. Q2.1984.RM	0.351	-0.352	0.972	0.681	-0.054	0.165	0.789	0.225	-0.389	-0.041	0.517	-0.307	0.274
33. Q3.1984.RM	1.401	-0.737	0.162	0.680	0.008	0.999	0.523	0.073	1.013	0.217	0.165	0.904	-0.023
34. Q4.1984.RM	-1.410	1.049	0.134	0.486	-0.182	0.178	1.174	2.807	0.388	-0.098	0.817	-0.790	0.018
35. Q1.1985.RM	1.706	0.510	1.298	1.000	0.020	2.069	2.993	1.530	0.313	-0.129	1.331	1.767	0.858
36. Q2.1985.RM	0.289	0.696	-0.141	-0.074	-0.059	-0.177	0.077	0.118	0.048	-0.158	0.181	0.596	0.146
37. Q3.1985.RM	-0.407	-0.403	0.373	0.139	-0.416	-1.626	-0.164	0.238	1.791	0.538	-0.208	0.945	0.173
38. Q4.1985.RM	0.748	-0.469	-0.150	0.897	0.459	0.028	0.996	0.835	0.002	-0.207	0.289	0.280	-0.285
39. Q1.1986.RM	0.297	0.161	0.846	0.942	0.326	0.589	0.589	0.087	0.363	-0.789	0.730	-0.147	1.289
40. Q2.1986.RM	-0.668	0.350	0.409	0.665	-0.061	-0.122	0.533	1.018	0.022	0.044	1.012	0.665	0.466
41. Q3.1986.RM	0.156	0.756	0.232	0.310	0.060	0.719	0.393	0.684	0.375	0.081	0.229	0.824	0.346
42. Q4.1986.RM	0.053	-0.264	0.381	0.627	0.206	0.045	-0.053	0.560	0.173	-0.269	0.818	0.391	0.523
43. Q1.1987.RM	0.660	0.309	0.448	0.718	-0.028	0.230	0.230	0.471	0.319	0.401	0.244	-0.127	0.468
44. Q2.1987.RM	0.479	0.303	1.052	1.042	-0.095	0.596	0.556	0.976	0.925	0.228	0.409	0.784	1.338
45. Q3.1987.RM	1.012	0.101	0.559	1.139	-0.060	1.152	1.019	1.188	0.163	0.368	0.581	0.835	0.784
46. Q4.1987.RM	0.898	0.627	0.381	0.981	0.055	0.601	1.180	0.656	0.491	0.140	0.335	0.559	0.880
47. Q1.1988.RM	0.106	0.065	0.826	0.926	0.226	0.987	0.934	1.226	0.072	0.317	-0.731	0.310	0.669
48. Q2.1988.RM	0.038	0.096	0.765	0.346	-0.039	0.391	0.007	0.532	-0.344	0.093	0.396	1.407	0.536
49. Q3.1988.RM	-0.240	0.059	0.706	0.706	0.021	0.507	1.235	0.687	0.094	0.582	0.396	1.171	-0.363
50. Q4.1988.RM	1.011	0.187	1.115	0.448	0.242	1.033	0.781	0.637	-0.454	-0.160	0.562	1.028	0.224
51. Q1.1989.RM	0.324	-0.082	0.923	0.923	-0.093	0.711	-0.169	0.756	0.045	0.369	0.853	0.171	0.438