CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents the results of the study, which are divided into 3 parts. First part is the descriptive statistics of samples. Second part is the econometric results. Third part is to discuss the implication of economic results.

4.1 Descriptive Statistics of Samples

The sample consists of 102 trade names including strength and dosage form with 1747 procurements in 3 hospital in the period of 1997 to 1998. The average lag time from July 2nd, 1997 to the first date of procurement that changes the price is 132.3 days or 4.41 months. Pharmaceutical companies adjust drug prices for the first time on average in the middle of November, 1997. Total procurements can be divided into 2 groups, procurements of original drugs (900) and local made drugs (847) or procurements of essential drugs (1077) and non-essential drugs (670). Mean, Median, Maximum, Minimum values of variables in the model are in Table 4.1.

From Table 4.1 average percentage change in foreign exchange rate of Thai baht and US dollar is 49.56 percent or the average exchange rate is 37.39 baht per dollar. Hospitals often procure the drugs (median) when the exchange rate is at 38.7275 baht per dollar or increase 54.91 percent from 25.76 baht per dollar. From July 2nd, 1997 to September 30th, 1998 exchange rate varied between 25.76 to 53.47 baht per dollar. In this period all items of drug prices increase 12.12 percent on average. Some drug prices used to increase up to 430.61 percent but some decrease 82.14 percent. Original drug prices increase 7.5 percent on average while local

Table 4.1 : Mean, Median, Maximum and Minimum Values of Variables.

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
% change in drug price	0.1212	0.0276	4.3061	-0.8214	0.4798
% change of original drugs	0.0750	0.0267	4.3061	- 0.8214	0.6656
% change of local made drugs	0.1699	0.0114	0.7248	- 0.7482	0.1598
% change of essential drugs	0.1423	0.0275	4.3061	- 0.8214	0.5814
% change of non-essential drugs	0.0870	0.0277	1.2353	- 0.6573	0.2349
% change in exchange rate	0.4956	0.5491	1.1389	0.0000	0.2752
% change in quantity	-0.0312	0.0000	1.3010	-2.47712	0.3687
Original drug	0.5152	1	1	0	0.4999
Essential drug	0.6165	1	1	0	0.4864
Change in value added tax	0.8363	1	1	0	0.3701
Cancellation of medium price	0.5770	1	1	0	0.4942
Change in CSMB scheme	0.3881	0	1	0	0.4875
Length of time	18.7596	20	34	4	8.5627
Time	24.3200	25	33	5	7.9700
Hospital 1	0.1780	0	1	0	0.3826
Hospital 2	0.3320	0	1	0	0.4711

made drugs increase 16.99 percent. Essential drug prices increase 14.23 percent on average while non-essential drug prices increase 8.70 percent. Average of time that hospitals procure drugs is on December 1997.

From July 2nd, 1997 to September 30th, 1998 Police General Hospital orders 311 procurements; Siriraj Hospital has 877 procurements and Ramathibodi Hospital makes 860 procurements. One thousand four hundred and sixty one procurements or 83.63 percent of total procurements are made after value added tax are increased to 10 percent. One thousand and eight procurements or 57.70 percent of total procurements are ordered while medium prices are cancelled. Six hundred and seventy eight procurements or 38.81 percent are arranged when CSMBS are changed.

4.2 Econometric Results

The analysis of determinants of percentage change in drug price can be made through ordinary least square (OLS) method. The regression result represent all data (number of samples = 1747) shown in Table 4.2.

Table 4.2 : Estimates of coefficient variables of percentage change in drug price in equation (1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
β_0	0.05209*	0.01349	3.86251	0.0001
DLNFX	0.21974*	0.09041	2.43066	0.0152
DLNFX*ORI	-0.03307	0.06435	-0.51380	0.6075
DLNFX*ED	0.01772	0.06506	0.27241	0.7853
ORI	-0.00137	0.01206	-0.11316	0.9099
ED	-0.00377	0.01213	-0.31112	0.7557
DLNQ	-0.03860*	0.00759	-5.08855	0.0000
VAT	0.00682	0.01266	0.53872	0.5901
MP	0.01992**	0.01091	1.82637	0.0680
CSMB	0.01463	0.00976	1.49890	0.1341
DT	-0.00269*	0.00059	-4.54994	0.0000
H1	-0.06956*	0.00789	-8.81037	0.0000
H2	-0.06407*	0.00638	-10.0368	0.0000

* Significant at 1 % level

** Significant at 10% level

R-squared	0.120503	Adjusted R-squared	0.114416
F-statistic	19.79838	Prob(F-statistic)	0.000000
Samples	1747		

Percentage change in foreign exchange rate of Thai baht and US dollar (DLNFX) are strongly and positively related to percentage change in drug prices. The estimated coefficient for drug prices on average is 0.2197 at one percent level of

significant. It indicates that percentage change in drug price on average increased by about 0.21 percent for every one percent increased in foreign exchange rate after July 2nd, 1997. When exchange rate depreciates by one percent, prices of essential drugs made by original firms increase 0.20 percent, while essential drugs made locally increase 0.24 percent. For non-essential drugs, original drugs increase 0.19 percent while local made drug increase 0.22 percent shown in Table 4.3.

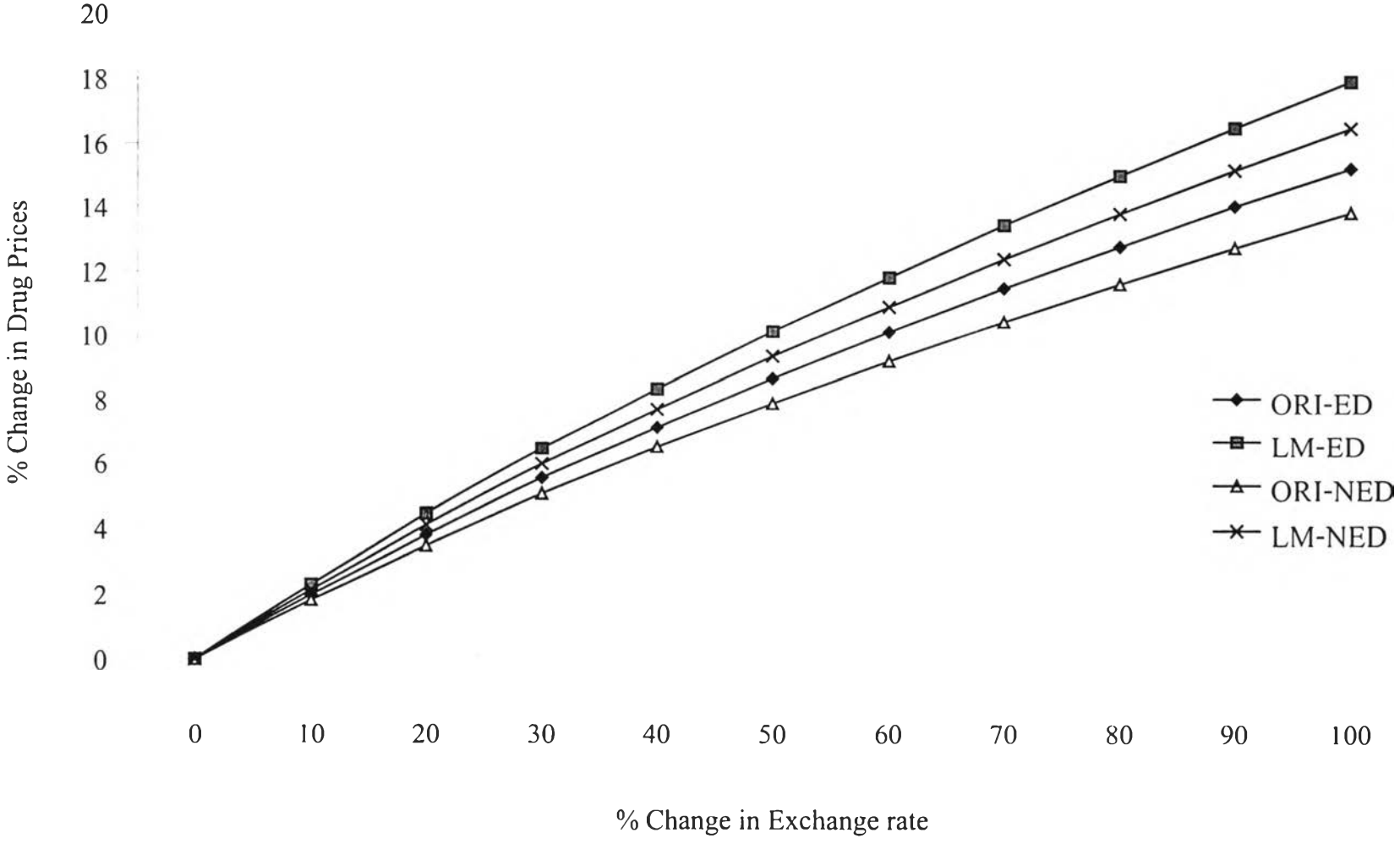
Table 4.3 : Percentage Change in Drug Prices in Each Type of Drugs When Exchange Rate Depreciates 1 Percent.

Type of drugs	Original drugs	Local made drugs
Essential drugs	0.2036	0.2366
Non-essential drugs	0.1859	0.2189

The coefficient of change in quantity procured (DLNQ) has a significantly impact on percentage change in drug prices at 1 percent level of significant. The sign of this coefficient is negative as hypothesized. The value of coefficient is -0.03860. One percentage change in quantity procured will lead to 0.039 percent decrease in prices.

The coefficient of length of time (DT) is statistically significant at 1 percent level of significant and has negative relationship with percentage change of drug price. The coefficient of -0.00269 means that the average prices of drugs decrease 0.003 percent per month after July 1997.

Figure 4.1 : Percentage Change in Drug Prices When Exchange Rate Changes.



This model proves that changes in drug price in each hospital are different. Among the three hospitals, Hospital 1 (Police General Hospital) and Hospital 2 (Siriraj Hospital) purchase the lower prices than drug prices in Ramathibodi Hospital. Drug prices in Police General Hospital is about 6.96 percent lower than in Ramathibodi Hospital while Siriraj Hospital is approximately 6.40 percent lower than in Ramathibodi Hospital at 1 percent level of significant.

The estimated coefficient of cancellation of medium price is 0.01992 at 10 percent level of significant. Cancellation of medium price has a positive impact on changes in drug prices as hypothesized and also shows greater flexibility of drug price movement. On the contrary, we find that a change in VAT rate and change in CSMBS has no statistically and significant impact on drug prices.

4.3 Discussion

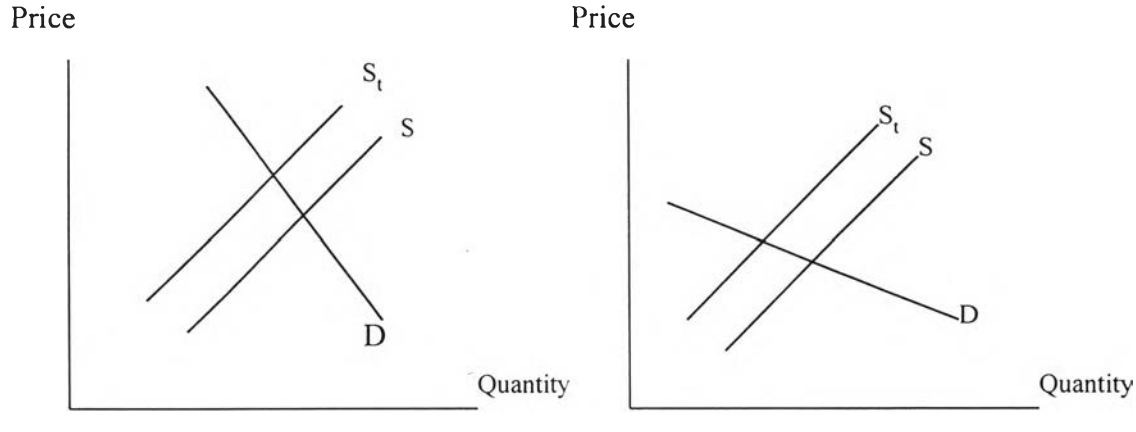
The result demonstrates that change in exchange rates alter drug prices in the same direction because increasing of exchange rate elevates the production costs of drugs, which corresponded with the hypothesis in chapter 3. It is found that change in exchange rate have greater effect on local made drug than original drugs. This may indicate that foreign drugs companies are more willing to adjust price downward or use price-cutting strategy in order to maintain their market share than local producers. Reason why prices of the original drugs appreciate less than drugs made locally is an interest topic for further study.

In addition, the ratio of change in drug prices and change in exchange rate is less than one. It means that pharmaceutical companies have to shoulder the risk of

fluctuation of Thai currency. Therefore, drug firms may absorb the remainder of higher cost from the change in foreign exchange rate.

When drugs are classified as essential and non-essential drugs, the impact of change in foreign exchange rate are different in each type. Depreciation of Baht will have greater impact on essential drug prices than non-essential drug prices. Prices of essential drugs increase higher than prices of non-essential drugs. An explanation could be that essential drugs have lower elasticity of demand than non-essential drugs. The demand curve of non-essential drug was flatter than curve of essential drugs as shown in figure 4.2. When the supply curve of both essential and non-essential drugs shifted to the left with the same amount or costs of the product increased, the essential drug prices increased higher than those of non-essential drugs.

Figure 4.2 : Demand and Supply Curves in Essential and Non-Essential Drugs before and after Economic Crisis



ESSENTIAL DRUGS NON-ESSENTIAL DRUGS

Where; S_t = Supply curve after economic crisis

S = Supply curve before economic crisis

D = Demand curve

The negative estimated coefficient of length of time means that prices of drugs reduce slightly during economic crisis because demand for drugs of the entire country declines or demand shifts to the left. One of the reasons to demonstrate that demand for drugs decline is decreasing of income of the country or negative growth of GDP in the time period of 1997 and 1998.

Besides, hospitals try to reduce number of items of drugs or hospital formularies so the competition among pharmaceutical companies also increases in order to maintaining the market share.

For the government regulations, change in value added tax does not have any effect on change in drug price because suppliers may absorb the burden of tax. Cancellation of medium price has profoundly effect on the change in drug price. When medium prices were cancelled, the drug prices inevitably increased. It can explained that procurement regulation was abated so hospitals may procure drugs more freely and have incentive to purchase the higher drug prices. The research about incentive that has influence on procurement decision-makers to purchase the higher prices should be concerned.