Econometric Analysis of South Sea and USSR Log Market in Japan

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Nine years have passed since the beginning of the period of slow economic growth, which started in 1974, following the year of the oil crisis. During this period there was a considerable change in the structure of timber demand/supply, compared with the period of rapid economic growth until 1973. Furthermore, when we review the recent domestic and overseas economic situations for timber, the state of timber demand/supply as based on the rapid economic growth as in the past cannot be expected, even in the comparatively distant future.

For such reasons, a study was made to build econometric models on timber demand/supply based mainly on the quarterly data after 1974.

Model building of timber demand/supply

1) Problems in model building

A major feature of the structure of timber demand/supply until about 1973 is pointed out as the increase, or rise, in the timber demand and price due to the demand side factors, particularly high level of housing and construction areas.

After 1974, when the period of slow economic growth began, the timber demand showed an extreme decline, to such an extent as never experienced before. On the other hand, the supply of foreign timbers has gained nearly a 70% share of the total timber supply in Japan. There was a considerable change in the supply situation as mentioned below.

(1) Changes in price and quantity of timber imports occur by fluctuations in exchange rate.

(2) Quantity of available South Sea tree species resources is insufficient.

(3) As in the case of OPEC, the SEALPA (South East Asia Lumber Producers Association) member countries emphasis on nationalism resulted in greater capitalization by the shippers in the South Sea log producing regions, and the proportional decline in the influence of the Japanese trading firms in the South Sea timber trade.

(4) The importance of export to Japan is greatly stressed by the major shippers on the U.S. Pacific Coast.

Thus, for the time of slow economic growth we have to build a model, in which the supply side factors, particularly the price in foreign timber production locations, or the fluctuations in exchange rate exert a stronger effect in determining the timber price.

With these facts in mind, we built a model for the respective market for domestic, US South Sea, and USSR logs, lumber and ordinary plywood, as shown in Fig. 1. In this paper, however, an econometric analysis only on the market of South Sea, and USSR logs and ordinary plywood is presented on account of limited space.

2) Model building

In building a timber supply/demand model, we have a problem how the market adjustment mechanism operates. Here, we will build a model that takes into consideration a market adjustment process capable of more accurately reflecting the characteristics of the timber market studied in the foregoing Fig. 1.

Generally, (1) price adjustment, (2) inventory adjustment, (3) operation capacity ad-

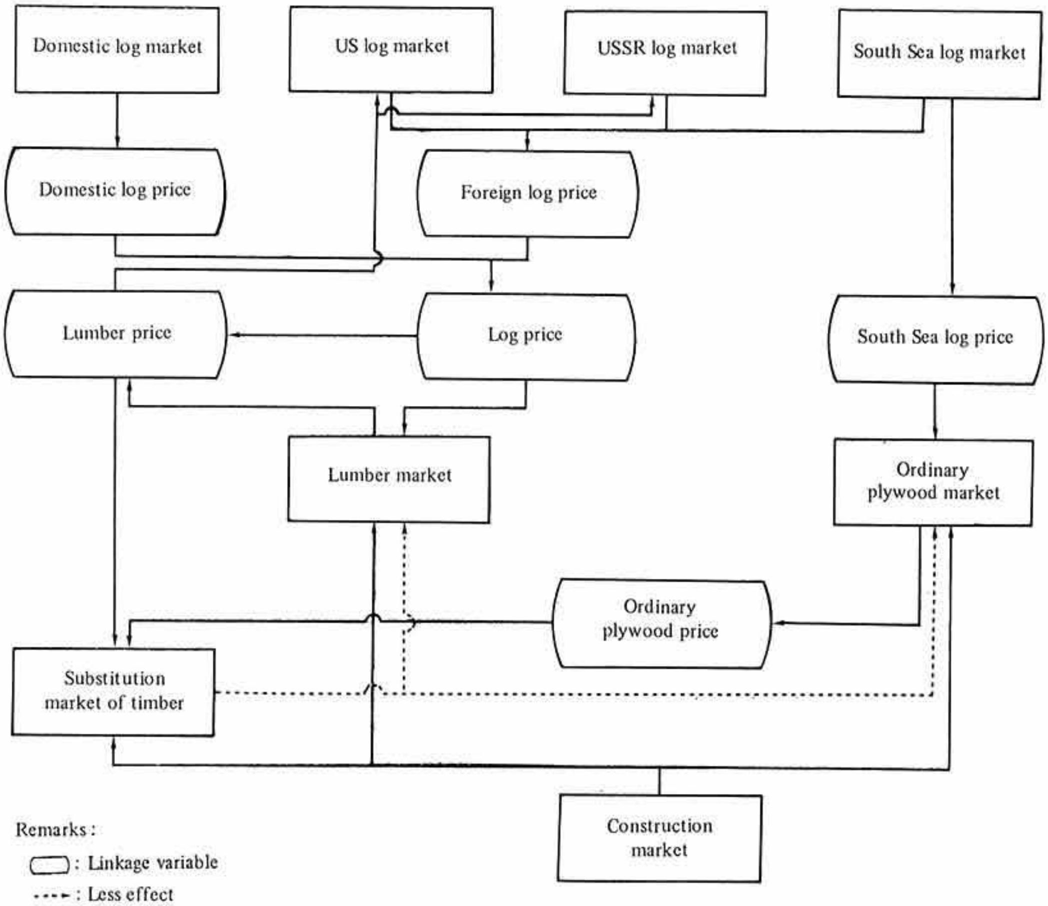

Fig. 1. Outline of model

justment, and (4) equipment adjustment may be given as the market adjustment mechanisms. The fundamental model, built with attention to the market adjustment mechanisms would be as follows:

Fundamental model

$D_t=F(P_t,\ B_t)$ ………(1)

$O_t=F(D_t^*,\ \theta_{t-1},\ OC_{t-1})$ ………(2)

$D_t^*=D_{t-\eta}$ ………(3)

$SJD_t=\gamma D_t$ ………(4)

$J_t=\delta(SJD_t-SJ_{t-1})_{t-\tau}$ ………(5)

$J_t=\delta\gamma D_{t-\eta-\tau}-\delta SJ_{t-1-\tau}$ …… (5-1)

$SJU_t=SJ_t-SJD_t$ ………(6)

$SJ_{t-1}+O_t=D_t+SJ_t$ ………(7)

$P_t=F(C_t,\ B_t,\ SJU_t)$ ………(8)

$\theta_t=(O/OC)_t$ ………(9)

$I_t=F(D_t,\ \theta_{t-\zeta})$ ………(10)

$OC_t=F(I_t,\ OC_{t-1})$ ………(11)

$CAP=(a-bT)/061$ …… (11-1)

; provided that $T\leqq60$. If $T\geqq61$, it becomes 1. D_t: demand, P_t : price, Bt : demand shift factor, O_t : production, D_t^* : expected demand, θ_{t-1} : operation capacity of former period, SJD_t : desirable inventory, γ : desirable inventory ratio, J_t : inventory investment, δ : adjustment coefficient, C_t : cost factor, SJU_t : undesirable inventory, I_t : equipment investment, OC_t : production capacity or supply capacity, CAP : capacity index, T : time trend, 061 : production or supply in 1980, a, b : estimated parameter, t, t-1, t-η…: t period, t-1 period, t-η period…

Equation (1) is a market demand function, and, as a given condition, is considered as an exogeneous condition for the behavior of economic subjects (for example, trading firms, sawmillers, etc.) described in equation (2) and thereafter. Using the demand volume determined by equation (1) as the basis, we may assume that the demand forecast by the economic subjects may be conducted with the η period time lag as in equation (3).

Equation (2) is the equation for production (or supply). Using the production capacity at the beginning of the period (OC_{t-1}, or the supply capacity), the explanation is supplied by the expected demand (D^*_t) and the preceding period's operation level (θ_{t-1}). Equations (3) to (5) are the inventory adjustment models of the Metzler-Darling type.[1,3,4] Equation (3) is the model which gives the actual demand for t-η period as the expected demand for t period. Equation (4) expresses the desirable inventory (SJD_t). Equation (5) shows the inventory investment (J_t) subjected to a certain adjustment (δ) after deducting the inventory at the beginning of the period (SJ_{t-1}) from the desirable inventory. Therefore, the ($SJD_t - SJ_{t-1}$) adjustment is not made at one time, but it is assumed that a partial adjustment (δ) is performed over the period τ. By substituting equation (3) and (4) for (5), equation (5) becomes the equation (5-1),[5] which can be estimated.

Many combinations are possible with equation (5-1) by supplying different η and τ lags. Here, we have prepared approximately 20 combinations each for US logs, South Sea logs, and USSR logs in port, lumber at the sawmill, and ordinary plywood at the plywood mill, and selected those estimated to be the most suitable. The desirable inventory ratio (γ) may be calculated with equation (5-1), and with the γ, the undesirable inventory is calculated with equations (4) and (6).

The timber market possesses a mechanism which increases the price uncertainty in both the supply and demand sides. Therefore, unless the unequilibrium of demand and supply is adjusted, the inventory adjustment will result in an undesirable inventory. Equation (8), the price determination equation, may be explained by an undesirable inventory generated, in addition to the supply and demand side factors (C_t, B_t).

Equation (9) gives the operation level, and equations (10) and (11) are the functions for the long term quantity adjustment. Because of the unavailability of data, these equations were not estimated for the presentation. With regard to the production capacity (or supply capacity), we employed the production capacity index ((11-1) equation),[2] developed by Klein's "trend through peaks" method.

For such reasons, and because of a limited data available, we adopted and estimated, in this paper, the timber demand model, which also includes the effect of inventory adjustment and price adjustment, or the short term market adjustment mechanism.

This causal relation may be expressed as follows:

SJU↗→P↘→D↗→SJU↘→P↗→D↘→
SJU↗→...

In other words, the increase in the undesirable inventory (SJU) caused by the excess supply lowers the price (P) and increases the demand (D), which decreases the undesirable inventory and raises the price, which in turn reduces the demand again resulting in increasing the undesirable inventory.

It is also necessary first to estimate the inventory adjustment, to which we employed the ordinary least square method (O.L.S.).

Statistical analysis of demand and supply modeling

1) Model estimate

Results are shown in Figs. 2 and 3, and Tables 1, 2, and 3.

2) Discussion of estimated value

(1) Inventory investment function

In estimating the model for the respective market, it is necessary first to estimate the inventory investment. The values meeting both the theoretical sign conditions and the t-values of the estimated parameters are satisfactory, as indicated by the equations (3-1)～(3-5). However, because we have no time

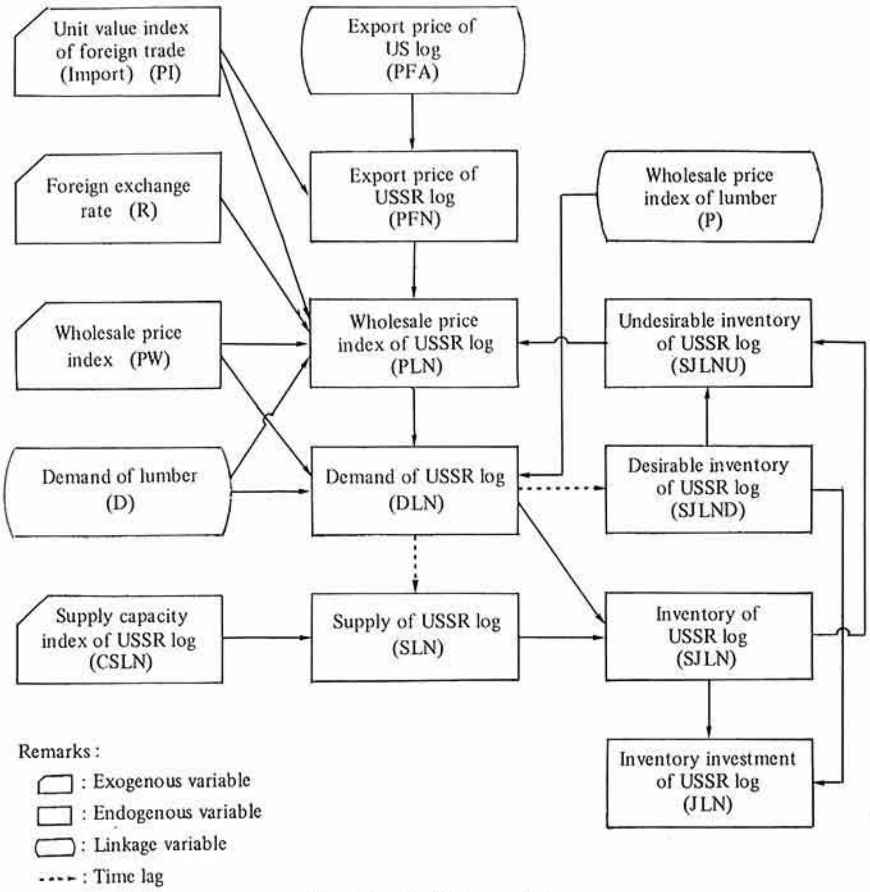

Fig. 2. USSR model

Table 1. USSR log model

(1-1) PFNPI =0.1211*PFAPI(-1)+0.26991*PFNPI(-1)-0.152527*D66
(5.2055) (2.1894) (-3.8669)
-0.069684*D1-0.031591*D2-0.011398*D3+0.11381
(-2.2412) (-1.0290) (-0.3711) (2.2219)
RR=0.8728, DH=0.9879, S=0.0614

(1-2) PFNPIR=PFNPI*R

(1-3) DLN =-15122.1*PLNPW+15839.7*PPW+3.94438*D+0.12064*DLN(-1)
(-4.6686) (2.7761) (5.2168) (0.8034)
[-0.8173] [0.8645] [2.0114]
+899.326*D1-337.672*D2+803.614*D3-22643.8
(1.4870) (-0.5338) (1.5393) (-4.2725)
RR=0.8820, DH=2.1083, S=1022.6226

(1-4) SLN =0.40959*DLN(-1)+318.859*CSLN-3839.21*DDMN+346.001*D1
(2.5708) (0.0829) (-4.2896) (0.4416)
+2282.06*D2+4107.99*D3+9757.97
(1.8679) (5.3653) (2.9863)
RR=0.8005, DW=1.7981, S=1491.4218

(1-5) JLN =0.1214*DLN(-4)-0.202346*SJLN(-4)-2456.26*DMJLN+2507.08*D1
(1.5450) (-2.7559) (-4.3865) (4.5263)
+2327.52*D2+4445.17*D3-1644.75
(4.2734) (7.8006) (-0.8639)
RR=0.7296, DW=1.9035, S=1086.0356

(1-6) SJLN =SJLN(-1)+SLN-DLN
(1-7) SJLND =0.6001*DLN(-1)
(1-8) SJLNU =SJLN-SJLND
(1-9) PLNPW=1.3393E-03*PFNPIR+4.7393E-05*D-8.433E-06*SJLNU+0.62408*PLNPW(-1)
(1.9167) (1.3436) (-1.5952) (5.4110)
[0.2160] [0.4472] [-0.02239]
+0.10689*D65+0.11469*D1+0.04383*D2+0.05188*D3-0.34663
(1.96160) (3.0337) (1.0481) (1.2604) (-1.1626)
RR=0.8746, DH=1.2861, S=0.0692

Note:
E-0.3, E-0.5: $*10^{-3}$ and $*10^{-5}$, respectively
( ) : t-value of the estimated parameter
[ ] : Elasticity of the estimated parameter
RR : Coefficient of determination adjusted for degree of freedom
S : standard error of the estimated equation
DW : Durbin-Watson ratio
DH : D-H ratio of the estimated equation including the lagged dependent variable on the right-hand side

$$DH = (1-0.5*DW)*\sqrt{\frac{n}{1-n*S_1^2}}$$

S_1: Standard error of the estimated parameter of the lagged dependent variable
n: Number of samples

Table 2. South Sea log model

(2-1) PFSPI =0.14718*PFAPI(-1)+0.54302*PFSPI(-1)+0.08102*D1+0.02951*D2
(4.1160) (4.9434) (1.4193) (0.5347)
+0.09992*D3-0.231429
(1.8092) (-2.6748)
RR=0.8567, DH=0.0491, S=0.1103
(2-2) PLSPW =0.82248*PFSPI+3.9209E-03*R+0.25683*COBPI+6.7798E-05*D
(11.4404) (7.9032) (3.6908) (1.6225)
[0.4081] [0.7255] [0.0328] [0.4906]
-3.750E-06*SJLSU(-1)+0.50196*PLSPW(-1)+0.05892*D1
(-1.4467) (9.4293) (1.7705)
[2.033]
-0.041265*D2-0.017607*D3-1.61353
(-1.3955) (-0.6125) (-3.9714)
RR=0.9765, DH=1.4718, S=0.0524
(2-3) DOP =19.276*HTMN-1346.78*POPPW+0.72512*DOP(-1)-21689.2*DMOP
(3.0776) (-0.0682) (6.2259) (-2.3667)
[0.1769] [-0.0231]
-23427.5*D1+7936.39*D2-26573.7*D3+57481.3
(-2.9010) (1.0540) (-3.7849) (1.5241)
RR=0.8258, DH=0.0615, S=13292.8241
(2-4) SOP =0.09229*DOP(-1)+0.81093*SOP(-1)-22451.5*D1+13908.5*D2
(1.0810) (8.7633) (-5.0948) (3.2862)
-9448.66*D3+40835.1
(-2.2050) (1.9212)
RR=0.9130, DH=4.8220, S=8445.8105

(2-5) JOP
$$\begin{array}{llll}
JOP = 0.02029*DOP(-4) & -0.294219*SJOP(-4) & +8805.12*DMJOP & +5313.86*D1 \\
(0.4647) & (-2.2782) & (2.7164) & (1.5766) \\
+2251.41*D2 & +13590.2*D3 & +2363.14 & \\
(0.6805) & (4.1017) & (0.0939) & \\
\end{array}$$
$$RR=0.5260, \quad DW=2.3412, \quad S=6365.2733$$

(2-6) DLS
$$\begin{array}{lllll}
DLS = -777.136*PLSPW & +0.04125*DOP & +1.93009*D & +0.57526*DLS(-1) & \\
(-0.5353) & (2.3848) & (1.5582) & (6.5323) & \\
[-0.0198] & [0.3325] & [0.3557] & & \\
+2352.5*DX & -302.992*D1 & +1846.49*D2 & -567.753*D3 & -15574.5 \\
(1.6287) & (-0.2665) & (1.9048) & (-0.5707) & (-1.7981) \\
\end{array}$$
$$RR=0.9412, \quad DH=1.0450, \quad S=2801.1540$$

(2-7) SLS
$$\begin{array}{llll}
SLS = 0.98196*DLS(-1) & +5831.02*CSLS & -5735.43*COBPI & -3176.99*DX \\
(10.9932) & (0.9200) & (-1.5764) & (-2.1105) \\
-4183.58*D1 & +4024.92*D2 & +1020.75*D3 & -1265.12 \\
(-1.9485) & (2.0402) & (0.4405) & (-0.3315) \\
\end{array}$$
$$RR=0.8597, \quad DW=1.7153, \quad S=4821.1026$$

(2-8) JLS
$$\begin{array}{llll}
JLS = 0.2392*DLS(-2) & -0.308894*SJLS(-2) & -5534.15*DMJLS & -1523.41*D1 \\
(3.9564) & (-3.9033) & (-3.1694) & (-1.0697) \\
+2773.44*D2 & +5351.2*D3 & -7748.72 & \\
(1.9653) & (3.7169) & (-2.6972) & \\
\end{array}$$
$$RR=0.6038, \quad DW=2.1788, \quad S=2849.7685$$

(2-9) $SJLS = SJLS(-1) + SLS - DLS$

(2-10) $SJLSD = 0.7744*DLS(-1)$

(2-11) $SJLSU = SJLS - SJLSD$

(2-12) $SJOP = SJOP(-1) + SOP - DOP$

(2-13) $SJOPD = 0.0690*DOP(-1)$

(2-14) $SJOPU = SJOP - SJOPD$

(2-15) POPPW
$$\begin{array}{llll}
POPPW = 0.18533*PLSPW & +1.0937E-04*HTMN & -1.399E-06*SJOPU & +0.5836*POPPW(-1) \\
(4.3123) & (3.8087) & (-0.6529) & (8.2767) \\
[0.2350] & [0.4014] & [0.09227] & \\
+0.15685*D1 & -0.033162*D2 & +0.01349*D3 & -0.131408 \\
(4.7956) & (-1.0391) & (0.4216) & (-0.6199) \\
\end{array}$$
$$RR=0.9090, \quad DH=1.4856, \quad S=0.0587$$

Table 3. Name of Variable

Exogenous variables

Variable	Description	Unit
COB	Freight	$/cu m
CSLN, CSLS	Supply capacity index of USSR and South Sea logs, respectively	after 1980=1.0
D1, D2, D3	Seasonal dummy	each period of first, second, third=1.0
DDMN, DMJLN, DMJLA, DMJOP, DMJLS, DMJ, DMOP	Irregular fluctuation dummy	
DX	Oil shock dummy	
HTMN	New housing units in Japan	100 units
PI	Unit value index of foreign trade (imports)	1975=100.0
PW	Wholesale price index	1975=100.0
R	Foreign exchange rate	¥/$

Endogenous variables

Variable	Description	Unit
D	Demand of lumber	1,000 cu m
DLA, DLN, DLS	Demand of US, USSR and South Sea logs, respectively	100 cu m
DOP	Demand of ordinary plywood	1,000 sq m

J : Inventory investment of lumber : 1,000 cu m
JLA, JLN, JLS : Inventory investment of US, USSR and South Sea logs, respectively : 100 cu m
JOP : Inventory investment of ordinary plywood : 1,000 sq m
P : Wholesale price index of lumber : 1975=100.0
PFA, PFN, PFS : Export price of US, USSR and South Sea logs for Japan, respectively : $/1,000$/c, $/cu m, $/cu m
PLN, PLS : Wholesale price index of USSR and South Sea logs, respectively : 1975=100.0
POP : Wholesale price index of ordinary plywood : 1975=100.0
SJ : Inventory of lumber : 1.000 cu m
SJLA, SJLN, SJLS : Inventory of US, USSR and South Sea logs, respectively : 100 cu m
SJLND, SJLSD : Desirable Inventory of USSR and South Sea logs respectively : 100 cu m
SJLNU, SJLSU : Undesirable inventory of USSR and South Sea logs, respectively : 100 cu m
SJOP : Inventory of ordinary plywood : 1,000 sq m
SJOPD : Desirable inventory of ordinary plywood : 1,000 sq m
SJOPU : Undesirable inventory of ordinary plywood : 1,000 sq m
SLN, SLS : Supply of USSR and South Sea logs, respectively : 100 cu m
D(-1), SLD(-1), PLDPW(-1), SJ(-2),... : Variables with time lag of 1 or 2,... period
PFAPI, PFNPI, PFNPIR,.... etc. : PFA/PI, PFN/PI, (PFN/PI)*R,..., etc.

trend in the inventory investment which is the difference between the preceding and current period inventory, and because the fluctuations in the inventory are large, the value of coefficient determination adjusted for degree of freedom (RR) is rather low, between 0.5 and 0.8.

Results of calculation of the desirable inventory ratio and adjustment coefficient are shown in Table 4.

Table 4. Estimated values of desirable inventory ratio and adjustment coefficient

Items	Desirable inventory ratio (γ)	Adjustment coefficient (δ)
US log ($\eta=1,\ \tau=1$)	0.646	0.496
South Sea Log ($\eta=1,\ \tau=1$)	0.774	0.309
USSR log ($\eta=1,\ \tau=3$)	0.600	0.202
Lumber ($\eta=1,\ \tau=1$)	0.088	0.276
Ordinary plywood $\eta=1,\ \tau=3$)	0.069	0.294

In the case of US logs, when we assumed that the demand for the preceding period is the expected demand ($\eta=1$), and the adjustment lag is one period ($\tau=1$), the desirable inventory ratio was 0.646, and the adjustment coefficient was 0.496. In other words, it can be seen that the desirable inventory is 64.6% of the expected demand for the quarter. Also, we can find that about 50% of the desirable inventory investment in the preceding period $((SJD_t-SJ_{t-1})_{t-1})$ has been adjusted by the actual inventory in this period. The desirable inventory ratio for South Sea log was the largest, 0.774, and we found about 20% of USSR log desirable inventory investment of three periods before was adjusted by the actual inventory investment in this period. The inventory adjustment lag of USSR logs is longer, compared with US and South Sea logs.

This means that the desirable inventory ratio at the lumber and ordinary plywood mills are far smaller than the respective imported log inventories in port, and when manufactured into finished products, almost no inventory remains.

Inventory investment functions are shown in Table 5.

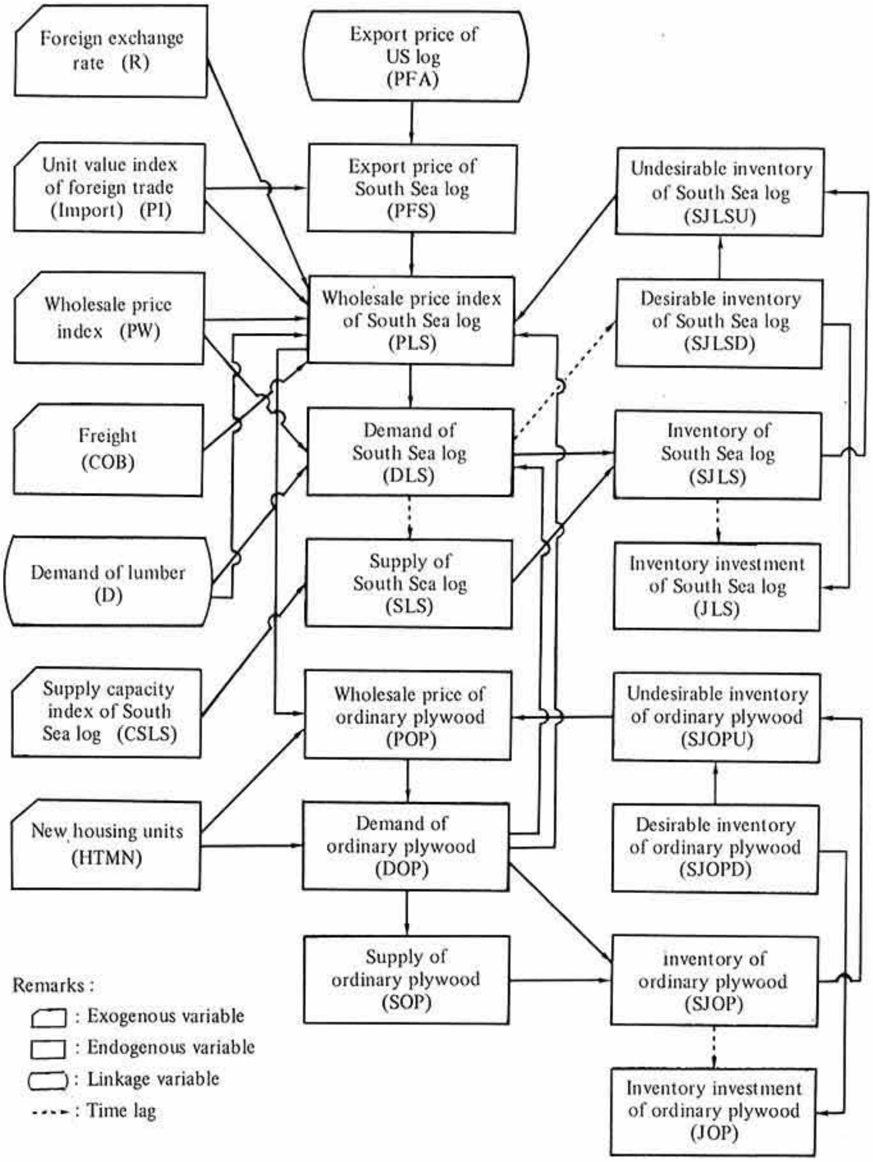

Fig. 3. South Sea log and ordinary plywood models

(2) USSR log market

The USSR logs compete with the US logs, since they are both used in a similar way. It is understood that the export price of US logs for Japan plays a role in the determination of the USSR log price. Accordingly, in the equation (1-1) the relative price of USSR logs exported to Japan and the unit value index of foreign trade (PFNPI(=PFN/PI)) are explained by the relative price of US logs exported to Japan and the unit value index of foreign trade of the preceding period (PFAPI (-1) (=PFA(-1)/PI(-1))).

The estimates are nearly satisfactory. The equation (1-3) is the demand equation of the USSR log market. Each elasticity of the USSR log demand with respect to the real USSR log price (PLNPW), real lumber price (PPW) and lumber demand (D) in the equation are −0.817, 0.865 and 2.011, respectively. In the

Table 5. Inventry investment function

US log

(3-1) JLA=0.32012*DLA(-2)-0.495934*SJLA(-2)-4829.9*DMJLA+3380.62*D1
(2.4826) (-4.3263) (-5.4094) (3.3513)
+4836.52*D2+4979.76*D3+1468.81
(5.0122) (5.2226) (0.3374)
RR=0.6890, DW=2.4798, S=1837.3135

USSR log

(3-2) JLN=0.1214*DLN(-4)-0.202346*SJLN(-4)-2456.26*DMJLN+2507.08*D1
(1.5450) (-2.7559) (-4.3865) (4.5263)
+2327.52*D2+4445.17*D3-1644.75
(4.2734) (7.8006) (-0.8639)
RR=0.7296, DW=1.9035, S=1086.0356

South Sea log

(3-3) JLS =0.2392*DLS(-2)-0.308894*SJLS(-2)-5534.15*DMJLS-1523.41*D1
(3.9564) (-3.9033) (-3.1694) (-1.0697)
+2773.44*D2+5351.2*D3-7748.72
(1.9653) (3.7169) (-2.6972)
RR=0.6038, DW=2.1788, S=2849.7685

Lumber

(3-4) J =0.02419*D(-2)-0.276031*SJ(-2)+49.68*DMJ+95.0771*DX+129.096*D1
(2.6421) (-4.9407) (1.6947) (4.0586) (6.0221)
-118.746*D2-39.8875*D3+61.2472
(-5.6701) (-1.8899) (0.5983)
RR=0.7789, DW=1.8579, S=57.8271

Ordinary plywood

(3-5) JOP =0.02029*DOP(-4)-0.294219*SJOP(-4)+8805.12*DMJOP+5313.86*D1
(0.4647) (-2.2782) (2.7164) (1.5766)
+2251.41*D2+13590.2*D3+2363.14
(0.6805) (4.1017) (0.0939)
RR=0.5260, DW=2.3412, S=6365.2733

equation of the US log demand, each elasticity of the US log demand with respect to the real US log price (PLAPW), PPW and D are -0.481, 0.802 and 0.753, respectively. When compared with the elasticities of the US log demand with respect to these independent variables, we can understand that the elasticities of USSR log demand are bigger, and the reaction to the market condition in Japan is of considerable flexibility. There is a reason, as mentioned below:

USSR logs compete with US logs, especially Hemlock, in the markets of strip and rafter. The competitive power of USSR logs is weaker than that of US logs, because USSR logs are smaller than US logs in size.

Accordingly, a slight fluctuation of the USSR log price, lumber price and lumber demand easily cause a decrease or increase of the USSR log demand. In the slow economic growth period, the USSR log market has a tendency of recession in the timber market in Japan.

In the equation (1-9), the real USSR log price (PLNPW) is explained by the PFNPIR (=(PFN/PI)*R: where PFN=export price of USSR logs for Japan, PI=unit value index of foreign trade and R=foreign exchange rate), the lumber demand (D) and undesirable inventory of USSR log (SJLNU), etc. The estimated values meeting the parameters are generally satisfactory. As shown by the values for the final test, the estimates are comparatively close to the actual values. However, significant levels of the t-values are slightly low. We also are somewhat concerned about the dependent variable of the preceding period (PLNPW(-1)), which has the largest effect on the real USSR log price (PLNPW), as well as on the real US log price (PLAPW). This is a point to be improved in the future.

(3) South Sea log market

South Sea logs are used by more than 60% for making plywood and by less than 40% for making lumber. Therefore, the South Sea log model was mapped out jointly with the ordinary plywood market. There are some characteristics of the estimate of the models, as shown below:

In the equation (2-1), the relative price of South Sea logs exported to Japan (PFSPI (=PFS/PI)) is determined mainly by the relative price of US logs exported to Japan in the preceding period (PFAPI(-1)). Although the export price of US logs for Japan plays a role of determining the South Sea log price, the SEALPA countries which lay emphasis on nationalism adopt the policy to control South Sea logs export in favor of their profits. Recently, the political factors, for example, the probability of a log embargo in Indonesia, reflect severely on the export price of South Sea logs for Japan.

In the equation (2-2), the elasticity of the real South Sea log price (PLSPW) with respect to PFSPI is 0.408. When compared with the elasticity, 0.205, of the real US log price (PLAPW) with respect to relative price for exporting US logs to Japan (PFAPI), we can understand that in the case of South Sea logs, the export price remarkably influences the South Sea log price in the Japanese market. As the estimated parameter of ordinary plywood (DOP), which is an explanation factor of the demand side, was not satisfactory, we had to eliminate DOP from the equation (2-2) of the real Sotuh Sea log price. The t-value of the lumber demand (D) is also on the low level in significance. On the other hand, the significant parameters estimated are the foreign exchange rate (R) and freight (COBPI(=COB/PI)). Both of them are factors on the supply side. As to their elasticities, the former is 0.726 and the latter 0.033. Accordingly, the effect of R in the South Sea log price is the most flexible among the variables in the equation (2-2).

As shown in equation (2-6) of the South Sea log demand (DLS), the price variable is not satisfactory. As regards the relationship of the DLS to demand side factors, the estimated parameter of DOP becomes the significant level of the t-value and is better than that of D. The elasticity of the DLS with respect to DOP results in 0.333.

In the equation (2-15), the real ordinary plywood price (POPPW) is explained by the real South Sea log price (PLSPW), the new housing units (HTMN) and undesirable inventory of ordinary plywood (SJOPU), etc., and the t-values of these main estimated parameters are highly significant, except for SJOPU. However, the value of the final test is not sufficiently satisfactory.

In the equation (2-3), although the ordinary plywood demand (DOP) is determined mainly by POPW and HTMN, the price variable is not enough to be significant for the t-value, as well as for the equation (5-6), of the South Sea log demand.

As a result, we can understand that in the case of the South Sea logs and ordinary plywood, their prices and the demand/supply do not so strongly interact each other, and that the South Sea log price is remarkably influenced by the foreign exchange rate and the export price of South Sea logs for Japan, which severely reflects political factors and the export price of US logs to Japan. Also, these prices: the export price of South Sea logs, South Sea log price and ordinary plywood price, do not definitely influence the demand of South Sea logs and ordinary plywood.

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