Chapter 6 Numerical Analysis

To demonstrate the potential advantages of the proposed method, numerical studies must be performed. Section 6.1 will proceed with sensitivity analysis to find out the restriction in the case study. Next, Section 6.2 will proceed with scenario analysis to show the practicality of the ILM.

6.1 Sensitivity Analysis

In order to understand how the system characteristics respond to the parameter changes, a sensitivity analysis must be performed. Since the objective functions are very complicated and the optimal values of the decision variables should be calculated through the search procedure, the sensitivity analysis will be performed by solving many sample problems. And the main parameters, discussed separately in section 6.1.1, 6.1.2, and 6.1.3, are recycle fee, subsidy, and weight. Finally, it will provide a brief summary in section 6.1.4.

6.1.1 Parameter of Recycle Fee

In this section, it will discuss the relationship between recycle fee and objective value in BLS. A general view of the result reveals several interesting characteristics discussed as follows.

1. It is not possible to impose a heavy recycle fee on IT products, Table 6.1-1 indicates that the highest recycle fee is 19286 NT dollars. If the recycle fee is over and above 19286 NT dollars, the objective value will become negative, which means there is no feasible solution in the condition and BLS cannot earn any money.
2. As Figure 6.1-1 tells that the more recycle fees RMF imposes, the less money BLS can earn.

By the way, the meaning of signs is represented as follows.

1. ○： The sign denotes that there is a feasible solution.

   ($NPR_{bl} \geqq 0$, $NPR_{rl} \geqq 0$, and $Z \geqq 0$)

2. △： The sign denotes there is a feasible solution when the model is programmed in another way. ($NPR_{bl} \geqq 0$, $NPR_{rl} \leqq 0$, and $Z \geqq 0$)

3. ╳： The sign denotes that there is no feasible solution.

   ($NPR_{bl} \leqq 0$, $NPR_{rl} \leqq 0$, or $Z \leqq 0$)

Table 6.1-1 Objective Value Under Different Recycle Fee in BLS

w_1	w_2	*Feasible*	*Z*	NPR_{bl}	NPR_{rl}	$NPR_{bl\text{-}rl}$	γ_o	RF	S
1	0	╳	-3	0	0	0	0.4382228	19287	317
1	0	○	22608	22608	0	22608	0.4382228	19286	317
1	0	○	278402600	278402600	0	278402600	0.4382228	15000	317
1	0	○	603157600	603157600	0	603157600	0.4382228	10000	317
1	0	○	927912600	927912600	0	927912600	0.4382228	5000	317
1	0	○	1250135000	1250135000	0	1250135000	0.4382228	39	317
1	0	○	1252668000	1252668000	0	1252668000	0.4382228	0	317

Italic: Output

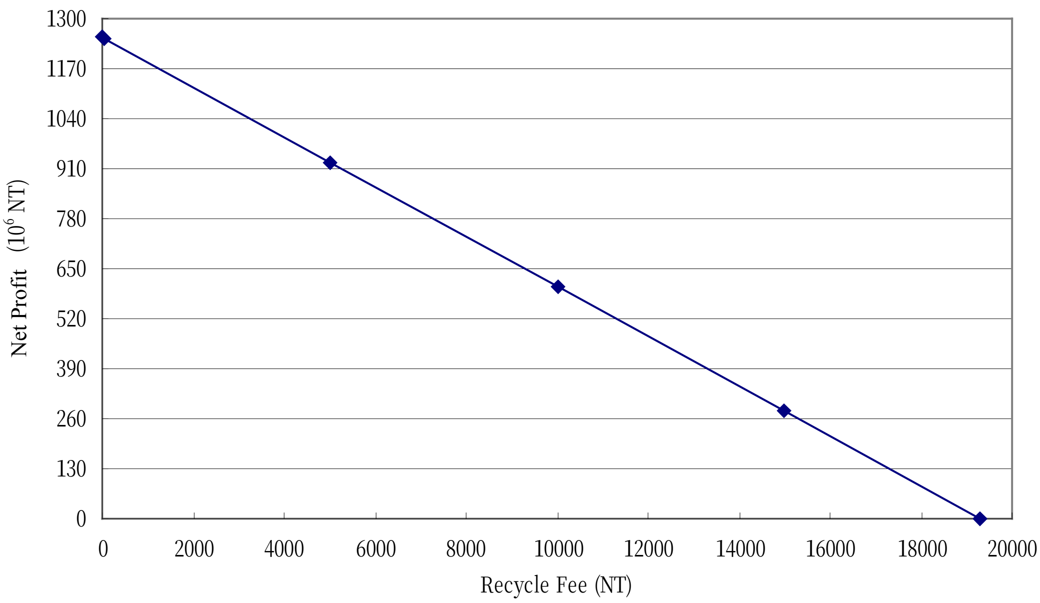

Figure 6.1-1 Net Profit Under Different Recycle Fee in BLS

6.1.2 Parameter of Subsidy

In this section, it will discuss the relationship between subsidy and objective value in RLS. A general view of the result reveals several interesting characteristics discussed as follows.

1. As Figure 6.1-2 tells that the more money RMF subsidizes, the more money RLS can earn.
2. As Table 6.1-2 indicates that RMF should subsidize 317 NT dollars at least, and then RLS could earn money.
3. As Table 6.1-2 indicates that RMF should subsidize 262 NT dollars at least, and then the optimal return ratio will become positive. As the information shows, this is equivalent to saying that RLS is ready to recycle useless products when the subsidy is 262 NT dollars at least.
4. As Figure 6.1-3 indicates that the more money RMF subsidizes, the higher optimal return ratio is. But the optimal return ratio will approximate 0.6862693 when the subsidy is over and above 2222 NT dollars. So it does not appear any worth to subsidize over and above 2222 NT dollars from the governmental side.

Table 6.1-2 Objective Value Under Different Subsidy in RLS

w_1	w_2	*Feasible*	*Z*	NPR_{bl}	NPR_{rl}	$NPR_{bl\text{-}rl}$	γ_o	RF	S
0	1	○	29080540	0	29080540	29080540	0.6862693	0	2400
0	1	○	26501650	0	26501650	26501650	0.6862693	0	2223
0	1	○	26487080	0	26487080	26487080	0.6862693	0	2222
0	1	○	26472510	0	26472510	26472510	0.6861794	0	2221
0	1	○	17848810	0	17848810	17848810	0.6739130	0	1622
0	1	○	9398791	0	9398791	9398791	0.6463481	0	1022
0	1	○	1937621	0	1937621	1937621	0.6157635	0	477
0	1	○	1924368	0	1924368	1924368	0.6157635	0	476
0	1	○	4794	0	4794	4794	0.4382228	0	317
0	1	X	-160	0	-5141	-5141	0.4382228	0	316
0	1	X	-2850	0	-91197	-91197	0.0244300	0	303
0	1	X	-3741	0	-119715	-119715	0.0231823	0	290
0	1	X	-5555	0	-177749	-177749	0.0033400	0	262
0	1	X	-5610	0	-179524	-179524	0	0	261
0	1	X	-10545	0	-326574	-326574	0	0	130
0	1	X	-19843	0	-634969	-634969	0	0	0

Italic: Output

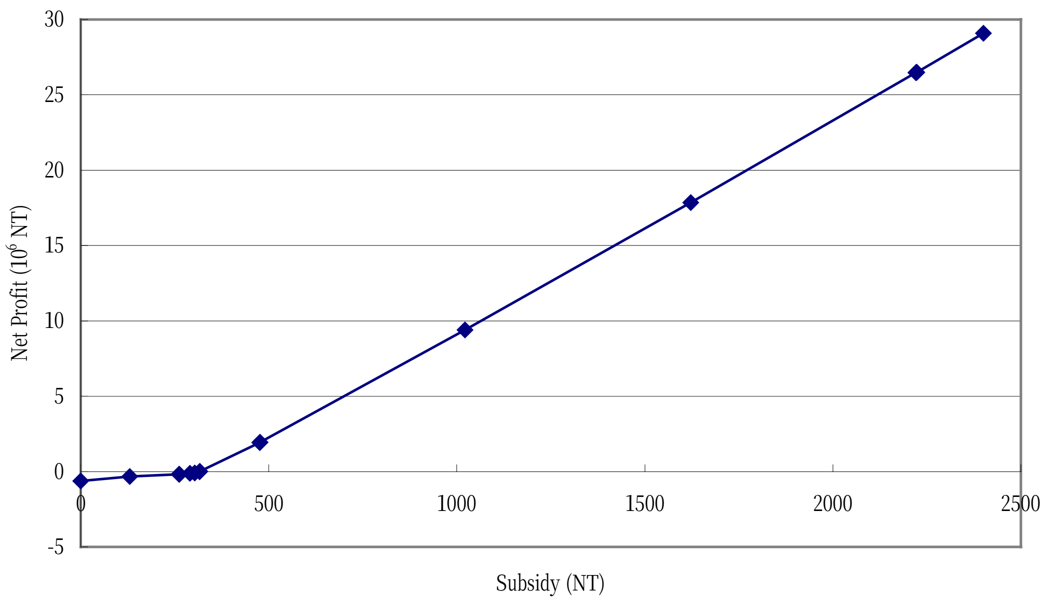

Figure 6.1-2 Net Profit Under Different Subsidy in RLS

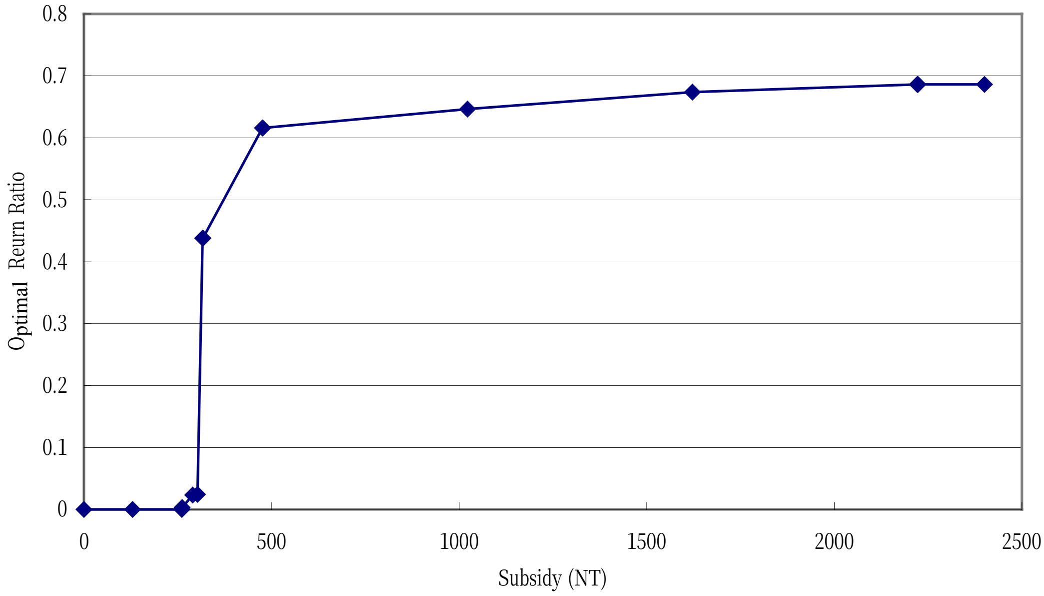

Figure 6.1-3 Optimal Return Ratio Under Different Subsidy in RLS

Next, it will discuss the relationship between return ratio and objective value in RLS. A general view of the result reveals several interesting characteristics discussed as follows.

1. As Table 6.1-3 indicates that the highest return ratio is 0.71 when the subsidy equals 2222, 1622, 1022, and 477 NT dollars. However, the highest return ratio is not so high when the subsidy equals 476 NT dollars. So it does not appear any worth to subsidize over and above 477 NT dollars from the governmental side.
2. As Figure 6.1-4 tells that the more money RMF subsidizes, the more money RLS can earn and the higher optimal return ratio is. So RMF should subsidize more money to promote achieving a higher return ratio from the environmental side.
3. As Figure 6.1-5 tells that there are feasible solutions when the return ratio is lower or equal to 0.71, which bases on the subsidy is equal to 477 NT

dollars.

4. As Figure 6.1-6 tells that there are feasible solutions when the return ratio is between 0.39 and 0.44, which bases on the subsidy is equal to 317 NT dollars.

Table 6.1-3 Objective Value Under Different Return Ratio in RLS

w_1	w_2	*Feasible*	*Z*	NPR_{bl}	NPR_{rl}	NPR_{bl-rl}	γ	RF	S
0	1	X	-4528	0	23563760	23563760	1.0	0	2222
0	1	X	-2659	0	23563760	23563760	0.9	0	2222
0	1	X	-790	0	23563760	23563760	0.8	0	2222
0	1	X	-3	0	24988660	24988660	0.72	0	2222
0	1	○	25425070	0	25425070	25425070	0.71	0	2222
0	1	○	25874160	0	25874160	25874160	0.7	0	2222
0	1	○	26487080	0	26487080	26487080	0.6862693	0	2222
0	1	○	24531190	0	24531190	24531190	0.6	0	2222
0	1	○	21072420	0	21072420	21072420	0.5	0	2222
0	1	○	17565890	0	17565890	17565890	0.4	0	2222
0	1	○	13994660	0	13994660	13994660	0.3	0	2222
0	1	○	10420840	0	10420840	10420840	0.2	0	2222
0	1	○	6840856	0	6840856	6840856	0.1	0	2222
0	1	○	3242421	0	3242421	3242421	0.0	0	2222
0	1	X	-4528	0	14821760	14821760	1.0	0	1622
0	1	X	-2659	0	14821760	14821760	0.9	0	1622
0	1	X	-790	0	14821760	14821760	0.8	0	1622
0	1	X	-3	0	16246660	16246660	0.72	0	1622
0	1	○	16683070	0	16683070	16683070	0.71	0	1622
0	1	○	17132160	0	17132160	17132160	0.7	0	1622
0	1	○	17848810	0	17848810	17848810	0.673913	0	1622
0	1	○	16756510	0	16756510	16756510	0.6	0	1622
0	1	○	14419020	0	14419020	14419020	0.5	0	1622
0	1	○	12033770	0	12033770	12033770	0.4	0	1622
0	1	○	9583817	0	9583817	9583817	0.3	0	1622
0	1	○	7131279	0	7131279	7131279	0.2	0	1622
0	1	○	4672576	0	4672576	4672576	0.1	0	1622
0	1	○	2195421	0	2195421	2195421	0.0	0	1622

0	1	x	-4528	0	6079765	6079765	1.0		0	1022
0	1	x	-2659	0	6079765	6079765	0.9		0	1022
0	1	x	-790	0	6079765	6079765	0.8		0	1022
0	1	x	-3	0	7504661	7504661	0.72		0	1022
0	1	○	7941068	0	7941068	7941068	0.71		0	1022
0	1	○	8390163	0	8390163	8390163	0.7		0	1022
0	1	○	9398791	0	9398791	9398791	0.6463481		0	1022
0	1	○	8981831	0	8981831	8981831	0.6		0	1022
0	1	○	7765621	0	7765621	7765621	0.5		0	1022
0	1	○	6501653	0	6501653	6501653	0.4		0	1022
0	1	○	5172977	0	5172977	5172977	0.3		0	1022
0	1	○	3841719	0	3841719	3841719	0.2		0	1022
0	1	○	2504296	0	2504296	2504296	0.1		0	1022
0	1	○	1148421	0	1148421	1148421	0.0		0	1022
0	1	x	-4991	0	0	0	1.0		0	477
0	1	x	-3123	0	0	0	0.9		0	477
0	1	x	-1254	0	0	0	0.8		0	477
0	1	x	-104	0	0	0	0.72		0	477
0	1	○	418	0	418	418	0.71		0	477
0	1	○	449513	0	449513	449513	0.7		0	477
0	1	○	1937621	0	1937621	1937621	0.6157635		0	477
0	1	○	1919830	0	1919830	1919830	0.6		0	477
0	1	○	1722116	0	1722116	1722116	0.5		0	477
0	1	○	1476644	0	1476644	1476644	0.4		0	477
0	1	○	1166464	0	1166464	1166464	0.3		0	477
0	1	○	853703	0	853703	853703	0.2		0	477
0	1	○	534775	0	534775	534775	0.1		0	477
0	1	○	197396	0	197396	197396	0.0		0	477
0	1	x	-4995	0	0	0	1.0		0	476
0	1	x	-3127	0	0	0	0.9		0	476
0	1	x	-1258	0	0	0	0.8		0	476
0	1	x	-9	0	0	0	0.71		0	476
0	1	○	434943	0	434943	434943	0.7		0	476
0	1	○	1924368	0	1937621	1937621	0.6157635		0	476
0	1	○	1906872	0	1906872	1906872	0.6		0	476
0	1	○	1711027	0	1711027	1711027	0.5		0	476
0	1	○	1467424	0	1467424	1467424	0.4		0	476

0	1	○	1159113	0	1159113	1159113	0.3	0	476
0	1	○	848220	0	848220	848220	0.2	0	476
0	1	○	531161	0	531161	531161	0.1	0	476
0	1	○	195651	0	195651	195651	0.0	0	476
0	1	X	-6154	0	0	0	1.0	0	317
0	1	X	-485	0	0	0	0.9	0	317
0	1	X	-2416	0	0	0	0.8	0	317
0	1	X	-19540	0	-585912	-585912	0.7	0	317
0	1	X	-4794	0	-153418	-153418	0.6	0	317
0	1	X	-1629	0	-52124	-52124	0.5	0	317
0	1	X	-119	0	-3807	-3807	0.45	0	317
0	1	○	3621	0	3621	3621	0.44	0	317
0	1	○	4794	0	4794	4794	0.4382228	0	317
0	1	○	1412	0	1412	1412	0.4	0	317
0	1	○	382	0	382	382	0.39	0	317
0	1	X	-21	0	-659	-659	0.38	0	317
0	1	X	-305	0	-9760	-9760	0.3	0	317
0	1	X	-735	0	-23514	-23514	0.2	0	317
0	1	X	-1357	0	-43433	-43433	0.1	0	317
0	1	X	-2556	0	-81804	-81804	0.0	0	317
0	1	X	-6495	0	0	0	1.0	0	303
0	1	X	-4626	0	0	0	0.9	0	303
0	1	X	-2758	0	0	0	0.8	0	303
0	1	X	-25754	0	-784075	-784075	0.7	0	303
0	1	X	-10463	0	-334828	-334828	0.6	0	303
0	1	X	-6480	0	-207370	-207370	0.5	0	303
0	1	X	-3990	0	-127670	-127670	0.4	0	303
0	1	X	-3521	0	-112679	-112679	0.3	0	303
0	1	X	-3133	0	-100270	-100270	0.2	0	303
0	1	X	-2958	0	-94027	-94027	0.1	0	303
0	1	X	-2850	0	-91197	-91197	0.02443	0	303
0	1	X	-3320	0	-106234	-106234	0.0	0	303
0	1	X	-20968	0	0	0	1.0	0	0
0	1	X	-19099	0	0	0	0.9	0	0
0	1	X	-17230	0	0	0	0.8	0	0
0	1	X	-157782	0	-4988571	-4988571	0.7	0	0
0	1	X	-133158	0	-4261041	-4261041	0.6	0	0

0	1	X	-111479	0	-3567337	-3567337	0.5	0	0
0	1	X	-91294	0	-2921391	-2921391	0.4	0	0
0	1	X	-73130	0	-2340154	-2340154	0.3	0	0
0	1	X	-55047	0	-1761498	-1761498	0.2	0	0
0	1	X	-37157	0	-1189008	-1189008	0.1	0	0
0	1	X	-19843	0	-634969	-634969	0.0	0	0

Italic: Output

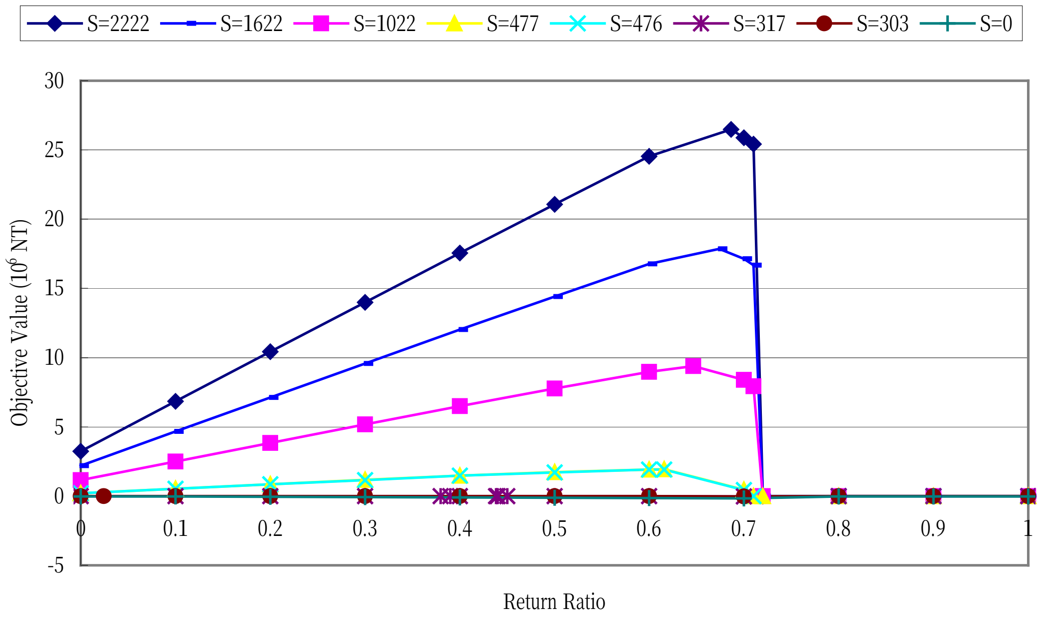

Figure 6.1-4 Objective Value Under Different Return Ratio in RLS

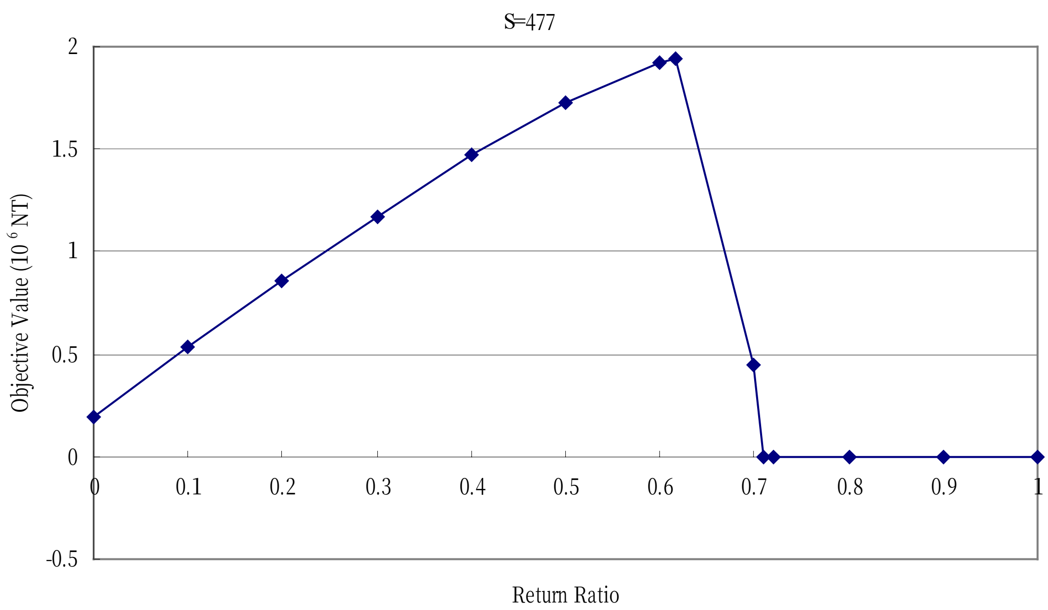

Figure 6.1-5 Objective Value Under Different Return Ratio in RLS (S=477)

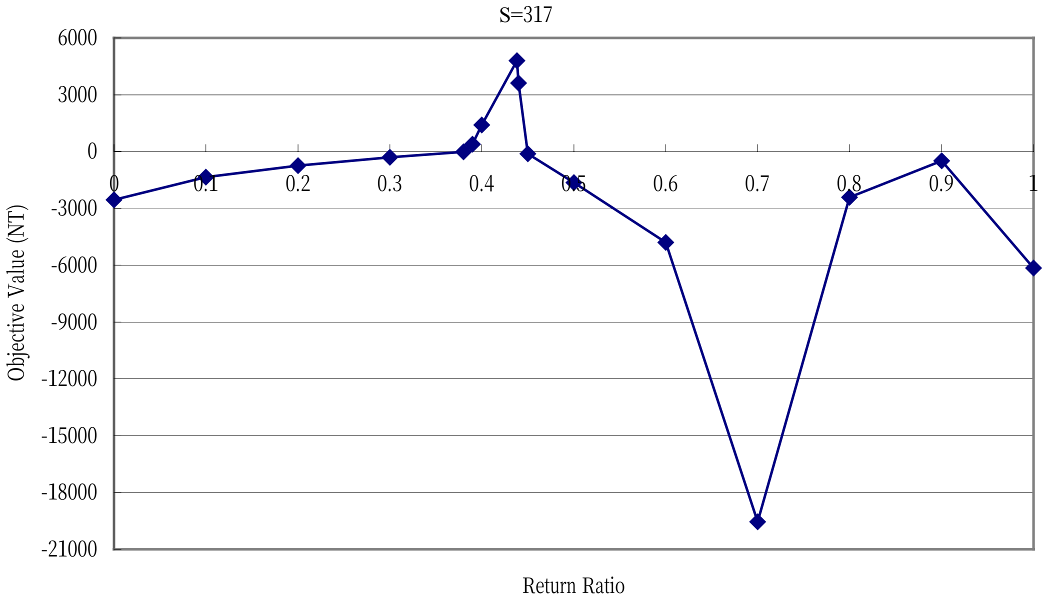

Figure 6.1-6 Objective Value Under Different Return Ratio in RLS (S=317)

6.1.3 Parameter of Weight

In this section, it will discuss the relationship between weight and objective value in ILS. A general view of the result reveals several interesting characteristics discussed as follows.

1. As Table 6.1-4 tells that the more w_1 is, the more money BLS can earn. On the other hand, the more w_2 is, the more money RLS can earn. As the information shows, this is equivalent to saying that there is the trade-off between BLS and RLS.
2. As Figure 6.1-7 shows that there is the maximal $NPR_{bl\text{-}rl}$ when w_1 is equal to 0.45. And the value of $NPR_{bl\text{-}rl}$ is 1254577959 NT dollars. As the information shows, it is to say that ILS could earn more money after integrating.
3. As Figure 6.1-8 tells that the less w_1 is, the higher optimal return ratio is.
4. As Figure 6.1-8 tells that there is the highest optimal return ratio, when w_1 is less or equal to 0.13. And the value of the highest γ_o is 0.6157635.

Table 6.1-4 Objective Value Under Different Weight in ILS

w_1	w_2	*Feasible*	*Z*	*NPR_{bl}*	*NPR_{rl}*	*NPR_{bl-rl}*	γ_o	RF	S
1.00	0.00	○	1253577000	1253577000	0	1253577000	0.6086427	0	477
0.90	0.10	○	1128220000	1253577000	0	1253577000	0.6086427	0	477
0.80	0.20	○	1002862000	1253577000	0	1253577000	0.6086427	0	477
0.79	0.21	○	990328300	1253488000	345621	1253833621	0.6086427	0	477
0.78	0.22	○	977797500	1253462000	441934	1253903934	0.6086427	0	477
0.75	0.25	○	940206900	1253462000	441934	1253903934	0.6086427	0	477
0.74	0.26	○	927677400	1253422000	559565	1253981565	0.6086427	0	477
0.70	0.30	○	877563000	1253422000	559565	1253981565	0.6086427	0	477
0.67	0.33	○	839977100	1253422000	559565	1253981565	0.6086427	0	477
0.66	0.34	○	827451100	1253311000	781142	1254092142	0.6086427	0	477
0.65	0.35	○	814925800	1253311000	781142	1254092142	0.6086427	0	477
0.64	0.36	○	802400500	1253311000	781142	1254092142	0.6086427	0	477
0.63	0.37	○	789880400	1252641000	1936802	1254577802	0.6086427	0	477
0.60	0.40	○	752359300	1252641000	1936802	1254577802	0.6086427	0	477
0.50	0.50	○	627288900	1252641000	1936802	1254577802	0.6086427	0	477
0.46	0.54	○	577260700	1252641000	1936802	1254577802	0.6086427	0	477
0.45	**0.55**	○	564753700	1252641000	1936959	**1254577959**	0.6098575	0	477
0.44	0.56	○	552246600	1252640000	1937394	1254577394	0.6133457	0	477
0.40	0.60	○	502218500	1252640000	1937394	1254577394	0.6133457	0	477
0.30	0.70	○	377148200	1252640000	1937394	1254577394	0.6133457	0	477
0.20	0.80	○	252078000	1252640000	1937394	1254577394	0.6133457	0	477
0.19	0.81	○	239570900	1252640000	1937394	1254577394	0.6133457	0	477
0.18	0.82	○	227063900	1252640000	1937398	1254577398	0.6133829	0	477
0.17	0.83	○	214556900	1252640000	1937521	1254577521	0.6145682	0	477
0.16	0.84	○	202049900	1252639000	1937560	1254576560	0.6149844	0	477
0.15	0.85	○	189542800	1252639000	1937575	1254576575	0.6151478	0	477
0.14	0.86	○	177035800	1252639000	1937579	1254576579	0.6151949	0	477
0.13	**0.87**	○	164528800	1252639000	1937621	1254576621	**0.6157635**	0	477
0.10	0.90	○	127007800	1252639000	1937621	1254576621	**0.6157635**	0	477
0.00	1.00	○	1937621	0	1937621	1937621	**0.6157635**	0	477

Italic: Output

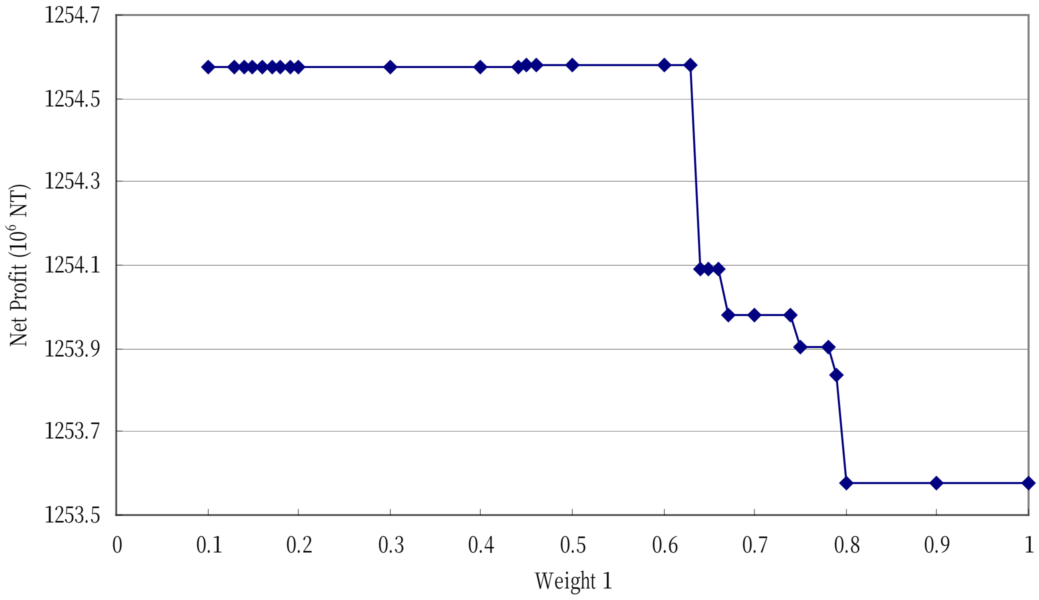

Figure 6.1-7 Net Profit Under Different Weight in ILS

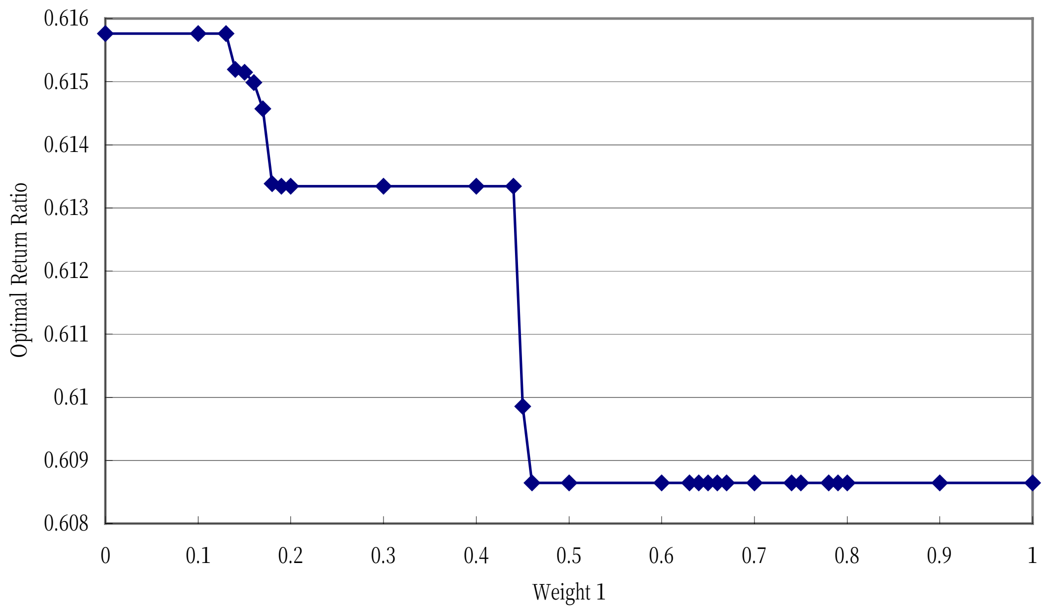

Figure 6.1-8 Optimal Return Ratio Under Different Weight in ILS

6.1.4 Brief Summary

In this section, it will provide a brief summary from aforementioned three sections. They are listed as follows.

1. The more recycle fee RMF imposes, the less money BLS can earn. So RMF could not impose a too heavy recycle fee on IT products. The highest recycle fee should be 19286 NT dollars.
2. The more money RMF subsidizes, the more money RLS can earn and the higher optimal return ratio is. But the optimal return ratio will approximate 0.6862693 when subsidy is over 2222 NT dollars. So RMF should subsidize more money to promote achieving a higher return ratio from the environmental side, however, it is not worth to subsidize over and above 2222 NT dollars.
3. RMF should subsidize 317 NT dollars at least, and then RLS could earn money. Besides, RMF should subsidize 262 NT dollars at least, and then RLS is ready to recycle useless products.
4. Although the optimal return ratio as the subsidy is 2222 NT dollars is higher than that the subsidy is 477 NT dollars, the highest return ratio is the same ($\gamma = 0.71$). In view of the government, it doesn't appear any worth to promote achieving the highest optimal return ratio ($\gamma_o = 0.6862693$), because it will cost more money. It follows from what has been said that it is not worth to subsidize over and above 477 NT dollars.
5. The last three points make it clear that the rational subsidy should be between 317 and 477 NT dollars for RLS. The most important addition to be made to achieving the maximum net profit and higher return ratio is the best subsidy should be 477 NT dollars.
6. It follows from remarks that there is the trade-off between BLS and RLS.

And when it puts more weight on RLS, the optimal return ratio will be higher, and the net profit in RLS will be also more. It is especially noteworthy that ILS could earn more money in the case of integrating.

6.2 Scenario Analysis

In this section, it will discuss two main scenarios. One is assumed government (RMF) is involved in ILS; it will be analyzed in section 6.2.1. Another is assumed ILS operates by outsourcing; it will be analyzed in section 6.2.2. Finally, there is a brief summary provided in section 6.2.3.

6.2.1 System Performance Under Governmental Involvement

In this scenario analysis, recycle fee is assumed 39 NT dollars, according to the announcement from RMF in 2003. Because the subsidy announced by RMF in 2003 is 303 NT dollars, which is not between 317 and 477 NT dollars. Therefore, it will perform three phases:

1. Phase Ⅰ: S=477. RLS can earn the most rational net profit.
2. Phase Ⅱ: S=317. RLS can earn the least net profit, i.e. $NPR_{rl} > 0$.
3. Phase Ⅲ: S=303. RLS cannot earn any net profit, i.e. $NPR_{rl} < 0$.

1. Phase Ⅰ: S=477

A general view of the result reveals several interesting characteristics discussed as follows.

(1) As Table 6.2-1 tells that the more w_1 is, the more money BLS can earn. On the other hand, the more w_2 is, the more money RLS can earn. As the information shows, this is equivalent to saying that there is the trade-off between BLS and RLS.

(2) As Table 6.2-1 indicates that there is a maximal NPR_{bl-rl}, when w_1 is more or equal to 0.58, which bases on the return ratio is equal to 0.71. And the

value of $NPR_{bl\text{-}rl}$ is 1250107000 NT dollars.

(3) As Table 6.2-1 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is between 0.27 and 0.26, which bases on the return ratio is equal to 0.6157635. And the value of $NPR_{bl\text{-}rl}$ is 1252044369 NT dollars.

(4) As Figure 6.2-1 tells that the value of $NPR_{bl\text{-}rl}$ when the return ratio equals 0.6157635 is greater than when the return ratio equals 0.71. As the information shows, it is to say that ILS can earn more money when γ is the optimal return ratio.

(5) From the environmental angle, RMF will promote to achieve the highest return ratio ($\gamma = 0.71$). In view of business, however, the private organization will insist on the optimal return ratio ($\gamma = 0.6157635$). If the private organization follows the intention of RMF to achieve the highest return ratio, it will lose 1937369 NT dollars.

Table 6.2-1 Objective Value Under Different Weight in ILS (S=477)

w_1	w_2	*Feasible*	*Z*	NPR_{bl}	NPR_{rl}	$NPR_{bl\text{-}rl}$	γ	RF	S
1.00	0.00	○	1250107000	1250107000	0	1250107000	0.71	39	477
0.90	0.10	○	1125096000	1250107000	0	1250107000	0.71	39	477
0.80	0.20	○	1000085000	1250107000	0	1250107000	0.71	39	477
0.70	0.30	○	875074800	1250107000	0	1250107000	0.71	39	477
0.60	0.40	○	750064100	1250107000	0	1250107000	0.71	39	477
0.58	0.42	○	725061900	1250107000	0	1250107000	0.71	39	477
0.57	0.43	○	712560900	1250106000	418	1250106418	0.71	39	477
0.50	0.50	○	625053500	1250106000	418	1250106418	0.71	39	477
0.40	0.60	○	500042800	1250106000	418	1250106418	0.71	39	477
0.30	0.70	○	375032200	1250106000	418	1250106418	0.71	39	477
0.20	0.80	○	250021600	1250106000	418	1250106418	0.71	39	477
0.10	0.90	○	125011000	1250106000	418	1250106418	0.71	39	477
0.00	1.00	○	418	0	418	418	0.71	39	477
1.00	0.00	○	1251044000	1251044000	0	1251044000	0.6157635	39	477

0.90	0.10	○	1125939000	1251044000	0	1251044000	0.6157635	39	477
0.80	0.20	○	1000835000	1251044000	0	1251044000	0.6157635	39	477
0.79	0.21	○	988326700	1250955000	342735	1251297735	0.6157635	39	477
0.78	0.22	○	950811400	1250929000	440021	1251369021	0.6157635	39	477
0.75	0.25	○	938306600	1250929000	440021	1251369021	0.6157635	39	477
0.74	0.26	○	925802400	1250888000	558999	1251446999	0.6157635	39	477
0.70	0.30	○	875789300	1250888000	558999	1251446999	0.6157635	39	477
0.67	0.33	○	838279400	1250888000	558999	1251446999	0.6157635	39	477
0.66	0.34	○	825778700	1250777000	781703	1251558703	0.6157635	39	477
0.64	0.36	○	800778800	1250777000	781703	1251558703	0.6157635	39	477
0.63	0.37	○	788284100	1250107000	1937363	1252044363	0.6157635	39	477
0.60	0.40	○	750839000	1250107000	1937363	1252044363	0.6157635	39	477
0.50	0.50	○	626022100	1250107000	1937363	1252044363	0.6157635	39	477
0.40	0.60	○	501205100	1250107000	1937363	1252044363	0.6157635	39	477
0.30	0.70	○	376388200	1250107000	1937363	1252044363	0.6157635	39	477
0.28	0.72	○	351424800	1250107000	1937363	1252044363	0.6157635	39	477
0.27	**0.73**	○	338943100	1250107000	1937369	**1252044369**	0.6157635	39	477
0.26	**0.74**	○	326461400	1250107000	1937369	**1252044369**	0.6157635	39	477
0.25	0.75	○	313979700	1250106000	1937508	1252043508	0.6157635	39	477
0.24	0.76	○	301498000	1250106000	1937552	1252043552	0.6157635	39	477
0.23	0.77	○	289016300	1250106000	1937567	1252043567	0.6157635	39	477
0.22	0.78	○	276534700	1250106000	1937572	1252043572	0.6157635	39	477
0.21	0.79	○	264053000	1250106000	1937576	1252043576	0.6157635	39	477
0.20	0.80	○	251571300	1250106000	1937621	1252043621	0.6157635	39	477
0.10	0.90	○	126754500	1250106000	1937621	1252043621	0.6157635	39	477
0.00	1.00	○	1937621	0	1937621	1937621	0.6157635	39	477

Italic: Output

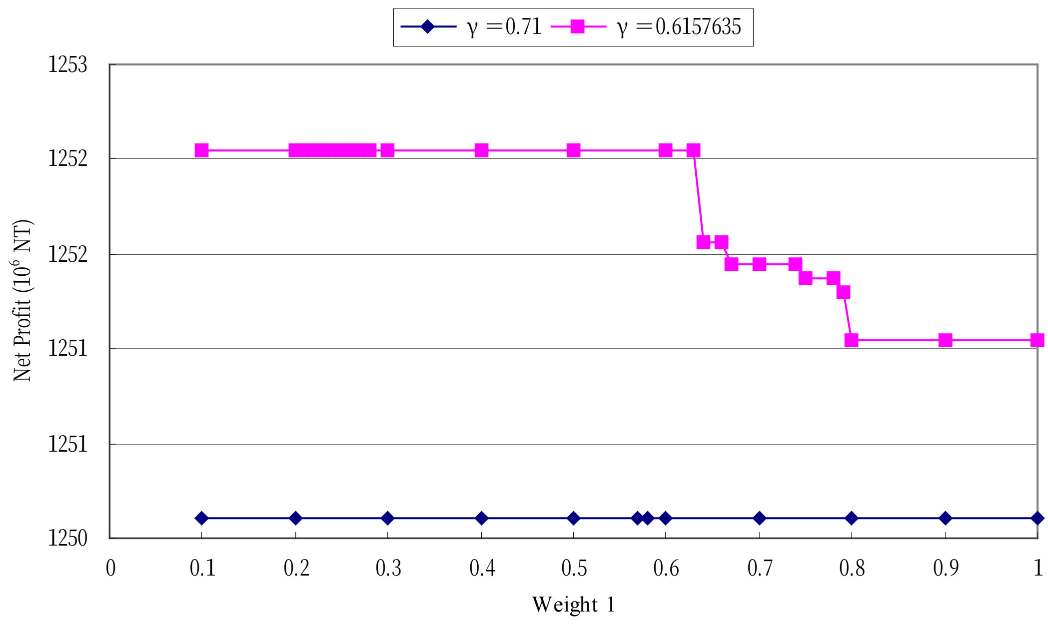

Figure 6.2-1 Net Profit Under Different Weight in ILS (S=477)

2. Phase Ⅱ: S=317

A general view of the result reveals several interesting characteristics discussed as follows.

(1) As Table 6.2-2 shows that the value of NPR_{rl} is negative when the return ratio equals to 0.71.

(2) As Table 6.2-2 tells that the more w_1 is, the more money BLS can earn. On the other hand, the more w_2 is, the more money RLS can earn. As the information shows, this is equivalent to saying that there is the trade-off between BLS and RLS.

(3) As Table 6.2-2 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is less than 0.15 but not equal to 0, which bases on the return ratio is equal to 0.71. And the value of $NPR_{bl\text{-}rl}$ is 1247776325 NT dollars.

(4) As Table 6.2-2 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is equal to 0.55, which bases on the return ratio is equal to 0.44. And the value of

$NPR_{bl\text{-}rl}$ is 1250135010 NT dollars.

(5) As Table 6.2-2 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is less than 0.54 but not equal to 0, which bases on the return ratio is equal to 0.4382228. And the value of $NPR_{bl\text{-}rl}$ is 1250135794 NT dollars.

(6) As Figure 6.2-2 tells that the value of $NPR_{bl\text{-}rl}$ is the highest when return ratio equals to 0.4382228. As the information shows, it is to say that ILS can earn more money when γ is the optimal return ratio.

(7) From the environmental side, RMF will promote to achieve the highest return ratio ($\gamma = 0.71$). In view of business, however, the private organization will insist on the optimal return ratio ($\gamma = 0.4382228$). If the private organization follows the intention of RMF to achieve the highest return ratio, it will lose 2359469 NT dollars. On the other hand, if the private organization tries to achieve the rational return ratio ($\gamma = 0.44$), it will lose 784 NT dollars only.

Table 6.2-2 Objective Value Under Different Weight in ILS (S=317)

w_1	w_2	*Feasible*	*Z*	NPR_{bl}	NPR_{rl}	$NPR_{bl\text{-}rl}$	γ	RF	S
1.00	0.00	△	1252383000	1252383000	-368394663	883988337	0.71	39	317
0.90	0.10	△	1125813000	1251871699	-8711380	1243160319	0.71	39	317
0.80	0.20	△	999998400	1251473899	-5901934	1245571965	0.71	39	317
0.70	0.30	△	874510900	1250899364	-3726838	1247172527	0.71	39	317
0.60	0.40	△	749131900	1250113106	-2339054	1247774052	0.71	39	317
0.50	0.50	△	623887900	1250106107	-2330782	1247775325	0.71	39	317
0.40	0.60	△	498644100	1250106107	-2330782	1247775325	0.71	39	317
0.30	0.70	△	373400400	1250106107	-2330782	1247775325	0.71	39	317
0.20	0.80	△	248156700	1250106107	-2330782	1247775325	0.71	39	317
0.16	0.84	△	198059200	1250106107	-2330782	1247775325	0.71	39	317
0.15	0.85	△	185534800	1250107107	-2330782	1247776325	0.71	39	317
0.10	0.90	△	122912900	1250107107	-2330782	1247776325	0.71	39	317

0.00	1.00	△	-2330782	-1654933951	-2330782	-1657264733	0.71	39	317
1.00	0.00	○	1250134000	1250134000	0	1250134000	0.44	39	317
0.90	0.10	○	1125121000	1250134000	0	1250134000	0.44	39	317
0.80	0.20	○	1000107000	1250134000	0	1250134000	0.44	39	317
0.70	0.30	○	875093800	1250134000	0	1250134000	0.44	39	317
0.60	0.40	○	750080400	1250134000	0	1250134000	0.44	39	317
0.56	0.44	○	700075000	1250134000	0	1250134000	0.44	39	317
0.55	**0.45**	○	687573700	1250132000	3010	**1250135010**	0.44	39	317
0.54	0.46	○	675072400	1250131000	3621	1250134621	0.44	39	317
0.50	0.50	○	625067300	1250131000	3621	1250134621	0.44	39	317
0.40	0.60	○	500054600	1250131000	3621	1250134621	0.44	39	317
0.30	0.70	○	375041800	1250131000	3621	1250134621	0.44	39	317
0.20	0.80	○	250029100	1250131000	3621	1250134621	0.44	39	317
0.10	0.90	○	125016400	1250131000	3621	1250134621	0.44	39	317
0.00	1.00	○	3621	0	3621	3621	0.44	39	317
1.00	0.00	○	1250135000	1250135000	0	1250135000	0.4382228	39	317
0.90	0.10	○	1125121000	1250135000	0	1250135000	0.4382228	39	317
0.80	0.20	○	1000108000	1250135000	0	1250135000	0.4382228	39	317
0.70	0.30	○	875094200	1250135000	0	1250135000	0.4382228	39	317
0.60	0.40	○	750080700	1250135000	0	1250135000	0.4382228	39	317
0.56	0.44	○	700075300	1250135000	0	1250135000	0.4382228	39	317
0.55	0.45	○	687574000	1250131000	3965	1250134965	0.4382228	39	317
0.54	**0.46**	○	675072700	1250131000	4794	**1250135794**	0.4382228	39	317
0.50	0.50	○	625067700	1250131000	4794	**1250135794**	0.4382228	39	317
0.40	0.60	○	500055100	1250131000	4794	**1250135794**	0.4382228	39	317
0.30	0.70	○	375042500	1250131000	4794	**1250135794**	0.4382228	39	317
0.20	0.80	○	250030000	1250131000	4794	**1250135794**	0.4382228	39	317
0.10	0.90	○	125017400	1250131000	4794	**1250135794**	0.4382228	39	317
0.00	1.00	○	4794	0	4794	4794	0.4382228	39	317

Italic: Output

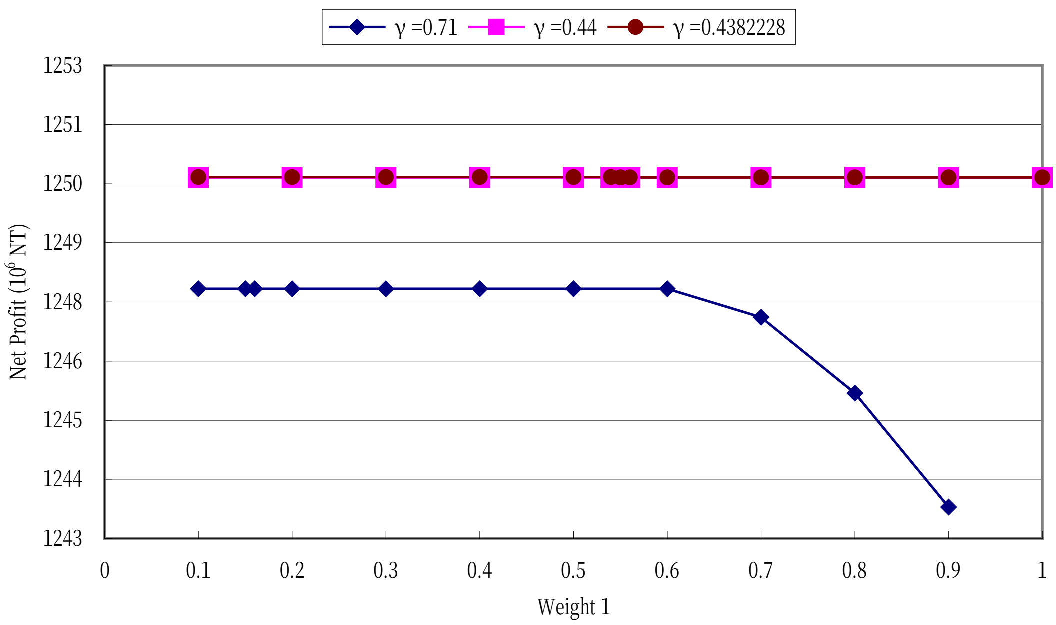

Figure 6.2-2 Net Profit Under Different Weight in ILS (S=317)

3. Phase Ⅲ: S=303

A general view of the result reveals several interesting characteristics discussed as follows.

(1) As Table 6.2-3 shows that the value of NPR_{rl} is negative.

(2) As Table 6.2-3 tells that the more w_1 is, the more money BLS can earn. On the other hand, the more w_2 is, the more money RLS can earn. As the information shows, this is equivalent to saying that there is the trade-off between BLS and RLS.

(3) As Table 6.2-3 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is less than 0.25 but not equal to 0, which bases on the return ratio is equal to 0.71. And the value of $NPR_{bl\text{-}rl}$ is 1247572345 NT dollars.

(4) As Table 6.2-3 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is less than 0.5 but not equal to 0, which bases on the return ratio is equal to 0.02443. And the value of $NPR_{bl\text{-}rl}$ is 1250052022 NT dollars.

(5) As Figure 6.2-3 tells that the value of NPR_{bl-rl} as the return ratio equals 0.02443 is greater than that the return ratio equals 0.71. As the information shows, it is to say that ILS can earn more money when γ is the optimal return ratio.

(6) From the environmental side, RMF will promote to achieve the highest return ratio ($\gamma = 0.71$). In view of business, however, the private organization will insist on the optimal return ratio ($\gamma = 0.02443$). If the private organization follows the intention of RMF to achieve the highest return ratio, it will lose 2479677 NT dollars.

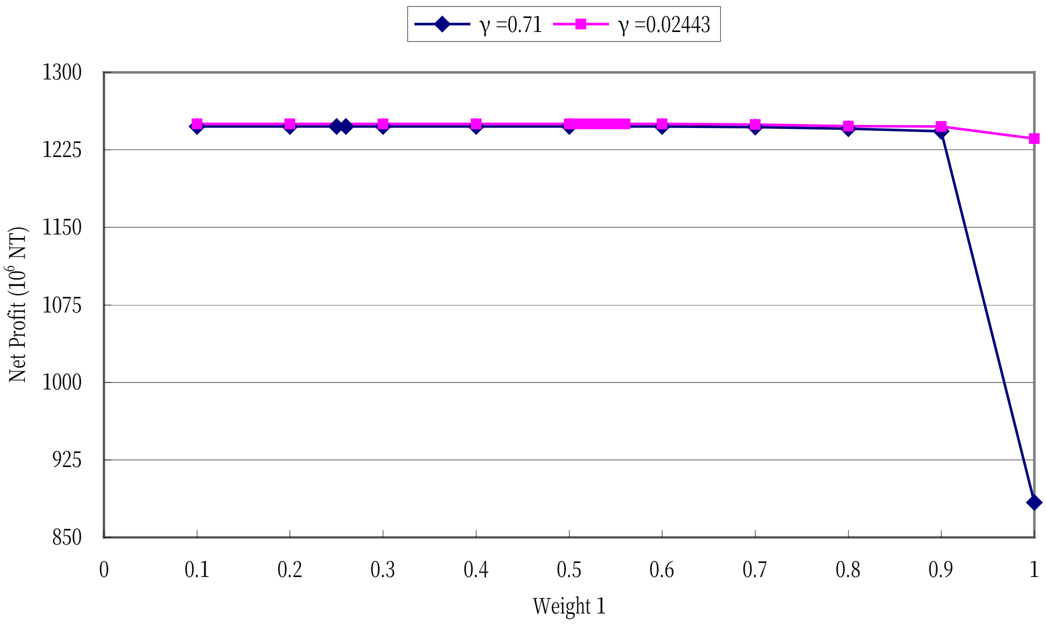

Figure 6.2-3 Net Profit Under Different Weight in ILS (S=303)

Table 6.2-3 Objective Value Under Different Weight in ILS (S=303)

w_1	w_2	*Feasible*	*Z*	*NPR_{bl}*	*NPR_{rl}*	*NPR_{bl-rl}*	γ	RF	S
1	0	△	1252383000	1252383000	-368598643	883784357	0.71	39	303
0.9	0.1	△	1125793000	1251870699	-8915360	1242955339	0.71	39	303
0.8	0.2	△	999957600	1251473899	-6105914	1245367985	0.71	39	303
0.7	0.3	△	874449700	1250899364	-3930818	1246968547	0.71	39	303
0.6	0.4	△	749050300	1250113106	-2543034	1247570072	0.71	39	303
0.5	0.5	△	623785900	1250106107	-2534762	1247571345	0.71	39	303
0.4	0.6	△	498521700	1250106107	-2534762	1247571345	0.71	39	303
0.3	0.7	△	373257600	1250106107	-2534762	1247571345	0.71	39	303
0.26	0.74	△	323152000	1250106107	-2534762	1247571345	0.71	39	303
0.25	0.75	△	310625600	1250107107	-2534762	1247572345	0.71	39	303
0.2	0.8	△	247993500	1250107107	-2534762	1247572345	0.71	39	303
0.1	0.9	△	122729400	1250107107	-2534762	1247572345	0.71	39	303
0	1	△	-2534762	-2718360178	-2534762	-2720894940	0.71	39	303
1	0	△	1251930000	1251930000	-16045861	1235884139	0.02443	39	303
0.9	0.1	△	1125906000	1251408512	-3617780	1247790732	0.02443	39	303
0.8	0.2	△	1000424000	1251361610	-3330073	1248031537	0.02443	39	303
0.7	0.3	△	875195200	1250815279	-1251642	1249563637	0.02443	39	303
0.6	0.4	△	750048900	1250143219	-91990	1250051229	0.02443	39	303
0.56	0.44	△	700039500	1250143219	-91558	1250051661	0.02443	39	303
0.55	0.45	△	687537200	1250142219	-91243	1250050976	0.02443	39	303
0.54	0.46	△	675034900	1250142219	-91197	1250051022	0.02443	39	303
0.53	0.47	△	662532500	1250142219	-91197	1250051022	0.02443	39	303
0.52	0.48	△	650030200	1250142219	-91197	1250051022	0.02443	39	303
0.51	0.49	△	637527800	1250142219	-91197	1250051022	0.02443	39	303
0.5	0.5	△	625025500	1250143219	-91197	1250052022	0.02443	39	303
0.4	0.6	△	500002200	1250143219	-91197	1250052022	0.02443	39	303
0.3	0.7	△	374978800	1250143219	-91197	1250052022	0.02443	39	303
0.2	0.8	△	249955500	1250143219	-91197	1250052022	0.02443	39	303
0.1	0.9	△	124932100	1250143219	-91197	1250052022	0.02443	39	303
0	1	△	-91197	-2885284244	-91197	-2885375441	0.02443	39	303

Italic: Output

Next, it will provide a comprehensive evaluation of the aforementioned three phases. And the discussions are listed as follows.

1. As Table 6.2-4 tells that the more money RMF subsidizes, the higher optimal return ratio is.
2. As Table 6.2-4 tells that the more money RMF subsidizes, the more money ILS can earn, which bases on γ is the optimal return ratio.
3. As Table 6.2-4 tells that the more money RMF subsidizes, the less money ILS will lose to achieve the highest or higher return ratio.
4. The higher return ratio is, the less money RLS can earn, which is based on the same subsidy and the optimal weight.
5. No matter in view of environment or business, the more money RMF can subsidize, the better performance of ILS can achieve. So, it follows from what has been said that the best subsidy is 477 NT dollars in this case study.
6. In this case study, the highest return ratio is 0.71. In other words, there will be a feasible solution when return ratio is less or equal to 0.71. Because the unit inventory cost, assumed as double of the unit selling price or the unit procurement cost, is too expensive to get a feasible solution.
7. According to the results of planning, it may be worth pointing out, in passing, that the higher return ratio is, the more inventories are. This is in accordance with earlier numerical results reported by van der Laan and Salomon [30], van der Laan et al. [31], and Fleischmann et al. [67]

Because 477 NT dollars is the best amount of subsidy suggested in this case study, only the results of planning are represented in section A.3 and discussed as follows.

1. Because the unit inventory cost is very expensive, most output of the inventory are as few as possible.
2. When the return ratio is higher, the inventories are also more in RLS but constant in BLS, which is based on the optimal weight. So the return ratio only influences RLS but BLS.

Table 6.2-4 The Comprehensive Evaluation of Three Phases

RF	S	γ	Weights	NPR_{bl-rl}	Difference
39	477	0.71	$w_1 \geqq 0.58$	1250107000	-1937369
		0.6157635	$0.26 \leqq w_1 \leqq 0.27$	1252044369	0
	317	0.71	$w_1 \leqq 0.15$but $w_1 \neq 0$	1247776325	-2359469
		0.44	$w_1 = 0.55$	1250135010	-784
		0.4382228	$w_1 \leqq 0.54$ but $w_1 \neq 0$	1250135794	0
	303	0.71	$w_1 \leqq 0.25$ but $w_1 \neq 0$	1247572345	-2479677
		0.02443	$w_1 \leqq 0.5$ but $w_1 \neq 0$	1250052022	0

6.2.2 System Performance Under Outsourcing

Due to limited availability of natural resources and growing concern for the environment, more and more countries in Europe establish stringent laws for ”product take back”. Often manufacturers are assigned to be responsible for the products after customer use and at the end of their lifecycle. [68]

In this scenario analysis, therefore, it is assumed ILS operates by outsourcing, so recycle fee should be equal to subsidy. From the reasonable angle, NPR_{bl} and NPR_{rl} should not be negative, so the charge should be higher or equal to 317 NT dollars. On the other hand, the charge should be lower or equal to 477 NT dollars in view of business. Therefore, it will perform two phases:

1. Phase Ⅳ: RF＝S=477. BLS can bear the highest charge.
2. Phase Ⅴ: RF＝S=317. RLS should need the lowest charge.

1. Phase Ⅳ: RF＝S=477

A general view of the result reveals several interesting characteristics discussed as follows.

(1) As Table 6.2-5 tells that the more w_1 is, the more money BLS can earn. On the other hand, the more w_2 is, the more money RLS can earn. As the information shows, this is equivalent to saying that there is the trade-off between BLS and RLS.

(2) As Table 6.2-5 indicates that there is a maximal $NPR_{bl\text{-}rl}$ when w_1 is less than 0.57 but not equal to 0, which bases on the return ratio is equal to 0.71. And the value of $NPR_{bl\text{-}rl}$ is 1221658418 NT dollars.

(3) As Table 6.2-5 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is equal to 0.21, which bases on the return ratio is equal to 0.6157635. And the value of $NPR_{bl\text{-}rl}$ is 1223595576 NT dollars.

(4) As Figure 6.2-4 tells that the value of $NPR_{bl\text{-}rl}$ as the return ratio equals 0.6157635 is greater than that the return ratio equals 0.71. As the information shows, it is to say that ILS can earn more money when γ is the optimal return ratio.

(5) From the environmental side, RMF will promote to achieve the highest return ratio ($\gamma = 0.71$). In view of business, however, the private organization will insist on the optimal return ratio ($\gamma = 0.6157635$). If the private organization follows the intention of RMF to achieve the highest return ratio, it will lose 1937158 NT dollars.

Table 6.2-5 Objective Value Under Different Weight in ILS (RF=S=477)

w_1	w_2	*Feasible*	*Z*	NPR_{bl}	NPR_{rl}	NPR_{bl-rl}	γ	RF	S
1.00	0.00	○	1221658000	1221658000	0	1221658000	0.71	477	477
0.90	0.10	○	1099492000	1221658000	0	1221658000	0.71	477	477
0.80	0.20	○	977326600	1221658000	0	1221658000	0.71	477	477
0.70	0.30	○	855160800	1221658000	0	1221658000	0.71	477	477
0.60	0.40	○	732995000	1221658000	0	1221658000	0.71	477	477
0.58	0.42	○	708561800	1221658000	0	1221658000	0.71	477	477
0.57	**0.43**	○	696345200	1221658000	418	**1221658418**	0.71	477	477
0.50	0.50	○	610829200	1221658000	418	**1221658418**	0.71	477	477
0.40	0.60	○	488663400	1221658000	418	**1221658418**	0.71	477	477
0.30	0.70	○	366497700	1221658000	418	**1221658418**	0.71	477	477
0.20	0.80	○	244331900	1221658000	418	**1221658418**	0.71	477	477
0.10	0.90	○	122166200	1221658000	418	**1221658418**	0.71	477	477
0.00	1.00	○	418	0	418	418	0.71	477	477
1.00	0.00	○	1222595000	1222595000	0	1222595000	0.6157635	477	477
0.90	0.10	○	1100336000	1222595000	0	1222595000	0.6157635	477	477
0.80	0.20	○	978076200	1222595000	0	1222595000	0.6157635	477	477
0.70	0.30	○	855875300	1222439000	0	1222439000	0.6157635	477	477
0.69	0.31	○	843656500	1222439000	558999	1222997999	0.6157635	477	477
0.67	0.33	○	819218900	1222439000	558999	1222997999	0.6157635	477	477
0.66	0.34	○	807002700	1222329000	781703	1223110703	0.6157635	477	477
0.64	0.36	○	782571800	1222329000	781703	1223110703	0.6157635	477	477
0.63	0.37	○	770361500	1221658000	1937363	1223595363	0.6157635	477	477
0.60	0.40	○	733769900	1221658000	1937363	1223595363	0.6157635	477	477
0.50	0.50	○	611797800	1221658000	1937363	1223595363	0.6157635	477	477
0.40	0.60	○	489825700	1221658000	1937363	1223595363	0.6157635	477	477
0.30	0.70	○	367853600	1221658000	1937363	1223595363	0.6157635	477	477
0.28	0.72	○	343459200	1221658000	1937363	1223595363	0.6157635	477	477
0.27	0.73	○	331262000	1221658000	1937369	1223595369	0.6157635	477	477
0.26	0.74	○	319064800	1221658000	1937369	1223595369	0.6157635	477	477
0.25	0.75	○	306867600	1221658000	1937508	1223595508	0.6157635	477	477
0.24	0.76	○	294670400	1221658000	1937552	1223595552	0.6157635	477	477
0.23	0.77	○	282473200	1221658000	1937567	1223595567	0.6157635	477	477
0.22	0.78	○	270276000	1221658000	1937572	1223595572	0.6157635	477	477
0.21	**0.79**	○	258078800	1221658000	1937576	**1223595576**	0.6157635	477	477

0.20	0.80	○	245881600	1221657000	1937621	1223594621	0.6157635	477	477
0.10	0.90	○	123909600	1221657000	1937621	1223594621	0.6157635	477	477
0.00	1.00	○	1937621	0	1937621	1937621	0.6157635	477	477

Italic: Output

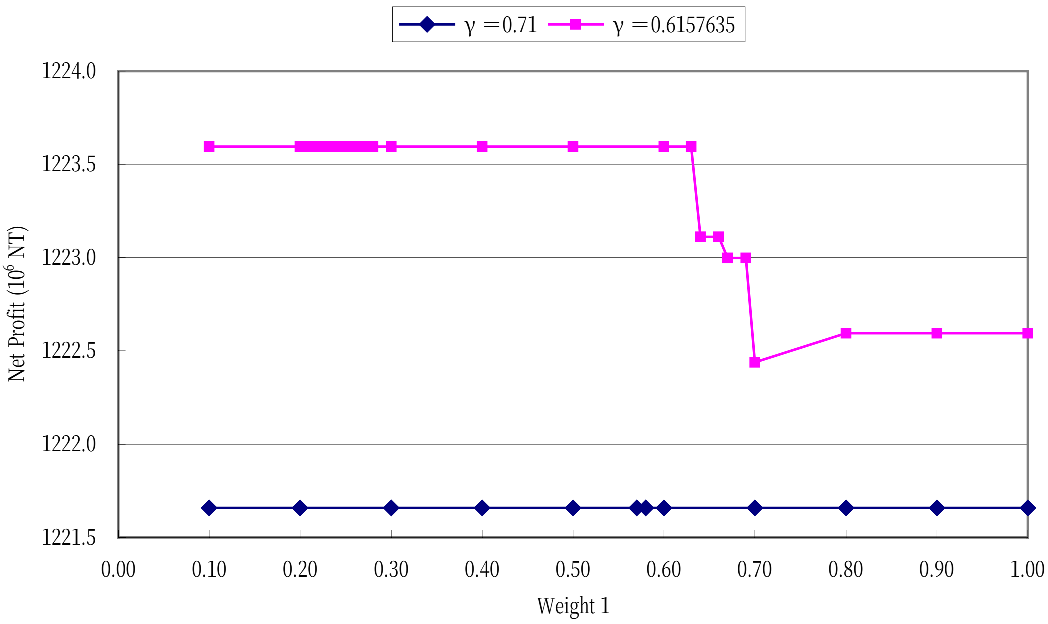

Figure 6.2-4 Net Profit Under Different Weight in ILS (RF=S=477)

2. Phase Ⅴ: RF＝S=317

A general view of the result reveals several interesting characteristics discussed as follows.

(1) As Table 6.2-6 tells that the more w_1 is, the more money BLS can earn. On the other hand, the more w_2 is, the more money RLS can earn. As the information shows, this is equivalent to saying that there is the trade-off between BLS and RLS.

(2) As Table 6.2-6 indicates that there is a maximal NPR_{bl-rl}, when w_1 is less than 0.54 but not equal to 0, which bases on the return ratio is equal to 0.44. And the value of NPR_{bl-rl} is 1232078621 NT dollars.

Table 6.2-6 Objective Value Under Different Weight in ILS (RF=S=317)

w_1	w_2	*Feasible*	*Z*	*NPR_{bl}*	*NPR_{rl}*	*NPR_{bl-rl}*	γ	RF	S
1.00	0.00	○	1232078000	1232078000	0	1232078000	0.44	317	317
0.90	0.10	○	1108870000	1232078000	0	1232078000	0.44	317	317
0.80	0.20	○	985662100	1232078000	0	1232078000	0.44	317	317
0.70	0.30	○	862454300	1232078000	0	1232078000	0.44	317	317
0.60	0.40	○	739246600	1232078000	0	1232078000	0.44	317	317
0.56	0.44	○	689963500	1232078000	0	1232078000	0.44	317	317
0.55	0.45	○	677642700	1232075000	3010	1232078010	0.44	317	317
0.54	**0.46**	○	665322000	1232075000	3621	**1232078621**	0.44	317	317
0.50	0.50	○	616039100	1232075000	3621	**1232078621**	0.44	317	317
0.40	0.60	○	492832000	1232075000	3621	**1232078621**	0.44	317	317
0.30	0.70	○	369624900	1232075000	3621	**1232078621**	0.44	317	317
0.20	0.80	○	246417800	1232075000	3621	**1232078621**	0.44	317	317
0.10	0.90	○	123210700	1232075000	3621	**1232078621**	0.44	317	317
0.00	1.00	○	3621	0	3621	3621	0.44	317	317
1.00	0.00	○	1232078000	1232078000	0	1232078000	0.438223	317	317
0.90	0.10	○	1108870000	1232078000	0	1232078000	0.438223	317	317
0.80	0.20	○	985662500	1232078000	0	1232078000	0.438223	317	317
0.70	0.30	○	862454700	1232078000	0	1232078000	0.438223	317	317
0.60	0.40	○	739246900	1232078000	0	1232078000	0.438223	317	317
0.56	0.44	○	689963800	1232078000	0	1232078000	0.438223	317	317
0.55	0.45	○	677643000	1232075000	0	1232075000	0.438223	317	317
0.54	**0.46**	○	665322300	1232074000	4794	**1232078794**	0.438223	317	317
0.50	0.50	○	616039500	1232074000	4794	**1232078794**	0.438223	317	317
0.40	0.60	○	492832600	1232074000	4794	**1232078794**	0.438223	317	317
0.30	0.70	○	369625600	1232074000	4794	**1232078794**	0.438223	317	317
0.20	0.80	○	246418700	1232074000	4794	**1232078794**	0.438223	317	317
0.10	0.90	○	123211700	1232074000	4794	**1232078794**	0.438223	317	317
0.00	1.00	○	4794	0	4794	4794	0.438223	317	317

Italic: Output

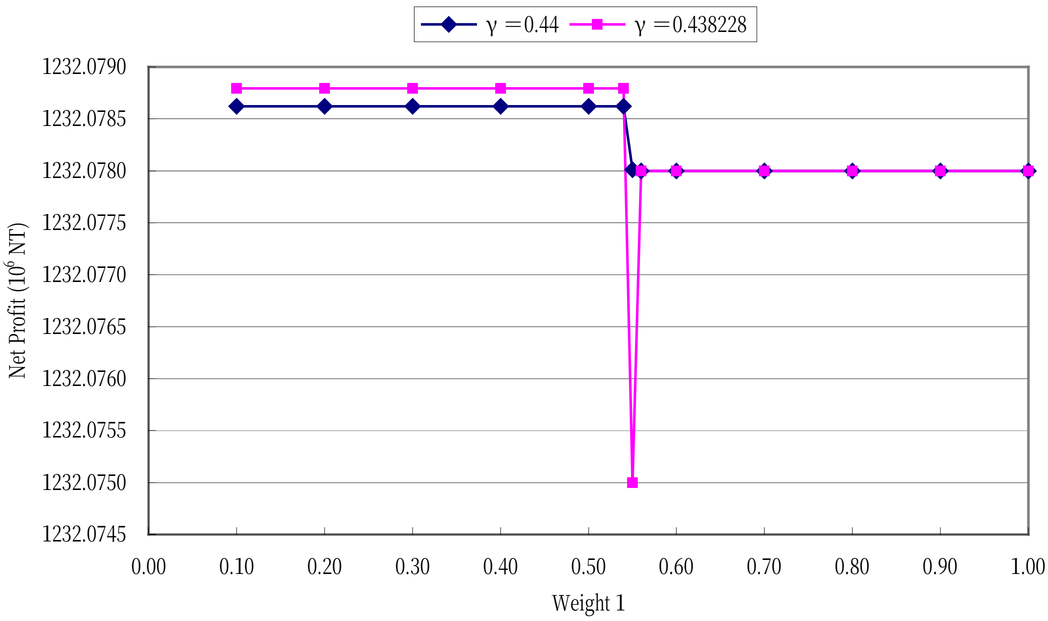

Figure 6.2-5 Net Profit Under Different Weight in ILS (RF=S=317)

(3) As Table 6.2-6 indicates that there is a maximal $NPR_{bl\text{-}rl}$, when w_1 is less than 0.54 but not equal to 0, which bases on the return ratio is equal to 0.438223. And the value of $NPR_{bl\text{-}rl}$ is 1232078794 NT dollars.

(4) As Figure 6.2-5 tells that the value of $NPR_{bl\text{-}rl}$ as the return ratio equals 0.438223 is almost greater than that the return ratio equals 0.44. As the information shows, it is to say that ILS can earn more money when γ is the optimal return ratio.

(5) From the environmental side, RMF will promote to achieve the highest return ratio ($\gamma = 0.44$). In view of business, however, the private organization will insist on the optimal return ratio ($\gamma = 0.438223$). If the private organization follows the intention of RMF to achieve the highest return ratio, it will lose 173 NT dollars.

Next, it will provide a comprehensive evaluation of the aforementioned two phases. And the discussions are listed as follows.

1. As Table 6.2-7 tells that the higher charge is, the less money ILS can earn.
2. As Table 6.2-7 tells that the higher charge is, the higher the optimal return ratio is.
3. As Table 6.2-7 tells that the higher charge is, the higher the highest return ratio is.
4. As Table 6.2-7 tells that the higher charge is, the more money ILS will lose to achieve the highest return ratio.
5. The higher return ratio is, the less money RLS can earn, which is based on the same charge and the optimal weight.
6. The higher charge is, the more money RLS can earn but BLS, which is based on the optimal return ratio. So, it follows from what has been said that the higher charge is, the better is for RLS but BLS. Therefore, as the information shows, this is equivalent to saying that there is the trade-off between BLS and RLS.
7. Obviously, there is a divergence between view of environment and business. From the environmental side, it is possible to achieve the highest return ratio ($\gamma = 0.71$) only when the charge is the highest (RF=S=477). On the other hand, it is possible to achieve the maximum net profit only when the charge is the lowest (RF=S=317) and the return ratio is 0.4382228, in view of business.
8. If the private organization follows the intention of RMF to achieve the highest return ratio, it will lose 10420376 NT dollars.

Table 6.2-7 The Comprehensive Evaluation of Two Phases

RF	S	γ	Weights	NPR_{bl-rl}	Difference	Difference
477	477	0.71	$w_1 \leqq 0.57$ but $w_1 \neq 0$	1221658418	-1937158	-10420376
		0.6157635	$w_1 = 0.21$	1223595576	0	
317	317	0.44	$w_1 \leqq 0.54$ but $w_1 \neq 0$	1232078621	-173	
		0.4382228	$w_1 \leqq 0.54$ but $w_1 \neq 0$	1232078794	0	

6.2.3 Brief Summary

In this section, it will provide a brief summary from aforementioned two sections. They are listed separately as follows.

The scenario under governmental involvement:

1. There is the trade-off between BLS and RLS.
2. There is the optimal weight in each condition and the optimal return ratio in each phase to earn the most money in the ILS.
3. The more money RMF subsidizes, the higher the optimal return ratio is and the less money ILS will lose to achieve the highest or higher return ratio. Besides, the more money RMF can subsidizes, the more money ILS can earn, which bases on γ is the optimal return ratio.
4. The higher return ratio is, the less money RLS can earn, which is based on the same subsidy and the optimal weight.
5. In this case study, the best subsidy should be 477 NT dollars. Because the more money RMF could subsidize, the better performance of ILS can achieve.
6. There will be a feasible solution when return ratio is less or equal to 0.71 in this case study.
7. Most output of the inventory are as few as possible.
8. The return ratio only influences RLS but BLS, which is based on the

optimal weight.

The scenario under outsourcing:

1. There is the trade-off between BLS and RLS.
2. There is the optimal weight in each condition and the optimal return ratio in each phase to earn the most money in the ILS.
3. The higher charge is, the less money ILS can earn and the more money ILS will lose to achieve the highest return ratio.
4. The higher return ratio is, the less money RLS can earn, which is based on the same charge and the optimal weight.
5. The higher charge is, the higher the optimal return ratio and the highest return ratio are, and the more money RLS can earn but BLS.
6. There is a divergence between views of environment and business.

Finally, it will also provide a comprehensive evaluation of the aforementioned two scenarios. And the discussions are listed as follows.

1. From Table 6.2-4 and 6.2-7, it is known that the ILS will lose less money to achieve the highest return ratio when RMF involves the system.
2. Based on the current condition (RF=39), the ILS will also earn more money when RMF involves the system.
3. It follows from last remarks that the current policy, governmental involvement, is better for the ILS to achieve the maximum net profit.