The Optimum Capital Structure of BOT Hydraulic Power Plant Projects

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Abstract

There are many mega-BOT projects under going at Taiwan, such as Taiwan High Speed Rail project, Koashoung MRT project, and Tran-airport MRT project. These projects encounter some problems which include the cost overrun, time delay and lack of banks' financial support. These problems lead to the possible failure of the projects, as well as the loss of the banks' investment. BOT projects are with project financing scheme which becomes more complicate as the projects become large scale or with long project term. Therefore, the risk evaluation and control are vital in such BOT projects.

Another important issue is the determination of the optimum capital structure of the BOT projects. Less investment by investors may increase the IRR of the project, but decrease the DSCR of the project. Small DSCR will enhance the probability of default of the BOT projects.

A project finance evaluation model (PFEM) is developed to analyze the project financial characteristics and to determine the optimum capital structure of a case study of Turkey electricity project. The results show that the payback period of the case study is 7.8~8.6 years. And the optimum capital structure is 21.79% ~ 34.36%. These information are useful for the bankers' and investors' reference

Key words：BOT, Project Financing,, Regression Analysis, Linear Programming, Optimal Capital Structure.

1. Introductions

Recently, the central government focuses too much on the social welfare, which results in shortage of governmental funding. At the same time, the economics situation becomes worse. It leads the reduction of government tax incomes. All of these make the government can not provide sufficient funds for all of required infrastructure construction. It seems that the introduction of private funds is a trend in Taiwan.

On the other hand, the managerial efficiency of private sectors is another factor to considering the privatization of infrastructure projects. Hence, to invite the private sectors to participate the infrastructure becomes popular, the approach of such scheme is called a public-private partnership (PPP Models). The most well known scheme is Build-Operate-Transfer (BOT). [1-9]

The feasibility of the BOT projects are depend on the profitability of the project and risk management of the project. Hence, to establish a sound financial model is crucial in project evaluation. Kakimoto et al [10] shows that there are three major components in a financial model, which are cost function, revenue function and the decision criteria.

World bank [11] provides a guideline for evaluating the financial feasibility of BOT projects. Some researches also indicate that the financial model needs to verify the risk of foreign exchange rate, interest rate, and inflation. [4-7]

Bakatjan et al [12] conducts a empirical study of a hydraulic power plant in Turkey. He provides a framework of financial analysis of BOT projects. The results show that IRR=14.94%、DSCR=1.5。Kim et al [13] conduct a multiple regression analysis with 530 data in Korea to estimate the construction cost. Zhang [14] point out that it is not easy to construct a complicate financial model. The work is very challenge. That is reason why this study is conducted.

2. PFEM Model: Assumptions and Theoretical Framework

- Assumptions:

(1). The financial funds are from equity and loan. Fund is assumed plenty enough.

(2). No other income is considered except the major income.

(3). Loan can be from single bank or syndicate banks.

(4). Grace period is equal to construction period. The payment is necessary only for interest in grace period. The equity holder is responsible to this interest and inflation cost.

(5). Land acquisition cost is included in base cost (BC).

(6). A compound tax ratio is considered in this study which is equal to 11%.

Theoretical framework

The modeling of PFEM is discussed in step by step fashion in the following section.

(1). Total project cost: cash out flow in construction phase

Cash flow in the construction phase is expenditure which is called cash outflows. Cash in this phase is to pay for the fee for every construction activities. The source of these cash is basically from equity and debts. It is necessary to estimate the required construction fee, and the time when the cash needs to be ready for payment.

Total project cost (TPC) is defined as follows:

$$TPC = BC + TEDC + TIDC \tag{1}$$

Where BC is construction cost of base case of the project estimated at market prices, TEDC is the cost escalation during construction, and TIDC is the interest during construction.) In additional, the time period for BOT projects is pretty long, such as 30~40 years. Hence, the money time effect is considered. The total project cost is a function , g, of BC, TEDC, and TIDC in equation 1a:

$$TPC = g(BC + TEDC + TIDC) \tag{1a}$$

BC is paid annually by the construction progress as in equation 2.

$$BC = \sum_{j=1}^{C_p} x_j \qquad for\ j = 1,2,.......,Cp \tag{2}$$

The estimate of construction cost is very important to the project feasibility indices. We assume construction fee, x_j, which is construction fee in j year.

In general, BOT projects required large amount of investment and construction period may be last for 4~5 years. The price escalation needs to be considered. The annual price escalation is shown in equation (3) and total price escalation is shown in equation (3a)：

$$EDC_j = x_j \prod_{k=0}^{j} (1+\theta k)\text{-}X_j \qquad , for\ j = 1,2,.....C_p \tag{3}$$

$$TEDC = \sum_{j=1}^{Cp} EDCj \qquad , for\ j = 1,2,......,C_p \tag{3a}$$

Where θ_K is inflation ratio in K year. θ_0=0. EDC_j is escalation fee in year j in construction phase. TEDC is total price escalation in construction period.

Interest is calculated by two major factors, which are loans amount and the timing of loan. The annual interest which needs to pay to banks is in equation (4). The total interest is in equation (4a).

$$IDC_j = \sum_{i=1}^{j} (1\text{-}\gamma_j) \times x_j \times \gamma \qquad , for\ j = 1,2,......., C_p \tag{4}$$

$$TIDC = \sum_{j=1}^{C_p} IDC_j \qquad , for\ j = 1,2,......., C_p \tag{4a}$$

Where IDC_j is the interest in the year j in construction phase. TIDC is total interest. γ_j 為 is capital structure in year j. We assume that $\gamma_j=\gamma$. r is the interest rate of the loan.

The interest and inflation in grace period is assumed to pay by equity holders. Total equity (TE) is in equation (5)：

$$TE = \gamma \times BC + TEDC + TIDC \tag{5}$$

If the equity holder is paid in the ratio γ_j in year j, then equity drawing in the jth year of construction is E_j ：

$$E_j = \gamma_j \times X_j + EDC_j + IDC_j \qquad ,j = 1,2,......., C_p \tag{5a}$$

(2). Total operation revenue: cash inflow in operation phase

Revenue in operation period is used to pay for installment, operation cost, and maintenance cost. The net cash inflow is $\beta_m$in equation (6)：

$$\beta_m = PBIT_m\text{-}TAX_m + DEP_m\text{-}ADI_m \qquad ,for\ m = 1,2,\ldots,O_p \tag{6}$$

Where β_m is the net annual cash available in mth year during operation. $PBIT_m$ is the profit before interest and tax at the mth year during operation. TAX_m is tax in mth year. DEP_m is the depreciation in mth year. ADI_m is the annual debt installment for mth year during operation. O_p is concession period.

The total project revenue is function, h, in the form of equation (6a)：

$$TPR = h(PBIT,\ TAX,\ DEP,\ ADI,t) \tag{6a}$$

We combine the income tax (25%) and sale tax (5%) into a tax ratio of 11%, which is commonly used in international pratise. TAX_m is the tax in mth year in equation (7)：

$$TAX_m = (PBIT_m\text{-}INT_m) \times 11\% \qquad ,for\ m = 1,2,\ldots,O_p \tag{7}$$

Where INT_m is interest in mth year.

Assumed grace period is G_N year. It is only needed to pay interest in grace period. No need to pay for principal. Debt repayment period is R_N year. ADI_m is annual equal installments of debt

$$ADI_m = (1\text{-}\gamma) \times BC \times (A/P,r,R_N) = (1\text{-}\gamma) \times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N}\text{-}1} \qquad ,m = 1,2,\ldots,R_N \tag{8}$$

Where (A/P,r,N) is capital recovery factor. A/P represents to calculate annual fee by present value. r is loan’s interest rate. DP_m is principal paid in mth year.

$$DP_m = ADI_m \times (P/F,r,R_N\text{-}m+1) = ADI_m \times (1+r)^{\text{-}(R_N\text{-}m+1)} \qquad ,m = 1,2,\ldots,R_N \tag{9}$$

Where (P/F,r,R_N-m+1) is single payment present worth factor. The interest paid in mth year is INT_m.

$$INT_m = (1+r) \times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N}\text{-}1} \times \left[1\text{-}(1+r)^{\text{-}(R_N\text{-}m+1)}\right], m = 1,2,\ldots,R_N \tag{10}$$

Substitute INT_m of the equation (10) into equation (7), we find

$$TAX_m = \left\{ PBIT_i (1+r) \times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N} -1} \times \left[1-(1+r)^{-(R_N-m+1)} \right] \right\} \times 0.11, m=1,2,\ldots,R_N \tag{11}$$

Depreciation is a non-cash expense. It is considered to reduce the tax amount. Common used depreciation methods are straight line depreciation method, declining balance depreciation method (DB), sum-of-years-digits depreciation method (SYD), and sinking fund depreciation method. The straight line depreciation method is adopted in this study. Hence, the total project cost (TPC) is depreciated in the length of operation year in equation (12)：

$$DEP_m = \frac{TPC}{O_P}, for\ m=1,2,\ldots,O_p \tag{12}$$

$PBIT_m$ is the gross profit before tax and interest in mth year of operation period：

$$PBIT_m = R_m - OM_m - DEP_m, for\ m=1,2,\ldots,O_p \tag{13}$$

Where R_m is annual revenue at mth year in operation. OM_m is annual operation and maintenance cost at mth year in operation. DEP_m is depreciation in mth year. A hydraulic power plant case is used as an empirical study, therefore its revenue equation is used here to explain the way how to calculated the revenue, R_m .

$$R_m = U_m P_m \qquad , for\ m=1,2,\ldots,O_p \tag{14}$$

Where U_m is unit price of electricity and its unit is U.S.cents/KW.h，P_m is net annual energy production with an unit of KW.h. The unit price of electricity is calculated in two stages. The first stage is in repayment period. In this period, the unit price, U_m, is decayed monotonous as shown in equation (15). After the repayment period, it enters second stage which U_m=U_2 in equation (16).

$$U_m = U_1 \times 0.95^{(m-1)}, if\ \ m \le R_N\ \ , for\ m=1,\ 2,\ldots,\ \le R_N \tag{15}$$

$$U_m = U2 \qquad , if\ \ m > R_N \qquad , for\ \ m=R_N\ +1,\ R_N\ +2, \ldots\ldots, O_p \tag{16}$$

Where U_1 is the highest unit price of electricity occurred in the first year of operation period. U_2 為 is the lowest unit price of electricity occurred in the last year of repayment period until to the last year of concession period. The lowest unit price of electricity is determined by the condition of $PBIT_m$=0. It is shown in equation (17) and (18). U_{av} is the average unit price of electricity. Rearrange the equations, the

U_1，is calculated by the equation (20).

$$PBIT_m = \left(P_{20} \times U_2 - OM_{20} - DEP_{20}\right) = 0 \tag{17}$$

$$U_2 = \frac{OM_{20} + DEP_{20}}{P_{20}} \tag{18}$$

$$U_{av} = \frac{\sum_{m=1}^{O_P} U_m}{O_P} = \frac{U_1 \times \sum_{m=1}^{R_N} 0.95^{(m-1)} + U_2 \times (O_P - R_N)}{O_P}, \; for\ m = 1,2,\ldots O_p \tag{19}$$

$$U_1 = \frac{U_{av} \times O_P - U_2 \times (O_P - R_N)}{\sum_{m=1}^{R_N} 0.95^{(m-1)}}, \; for\ m = 1,2,\ldots O_p \tag{20}$$

(3). Profitability indices of the projects

Six profitability indices are adopted in this study, which are NPV, IRR, ADSCR, ATIE, AROA, and AROE.

（1）、Net Present Value (NPV)

Net present value is obtained by subtracting the discount cash inflow in every year by the discount cash outflow in every year. When NPV>0 represents that the project can be invested. NPV is calculated in equation (21)

$$NPV = -\sum_{j=1}^{c_p} \frac{E_j}{(1+d)^j} + \sum_{m=1}^{O_P} \frac{\beta_m}{(1+d)^{m+c_p}}$$

$$= -\sum_{j=1}^{c_p} \frac{\gamma_j \times X_j + EDC_j + IDC_j}{(1+d)^j} + \sum_{m=1}^{O_P} \frac{R_m\text{-}OM_m\text{-}DEP_m\text{-}TAX_m + \frac{TPC}{O_P}\text{-}(1\text{-}\gamma \times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N}\text{-}1}}{(1+d)^{m+c_p}}$$

for j=1,2,...C_p for m=1,2,.. O_p (21)

where d is discount rate, or hurdle rate, or opportunity cost of capital. A right selection of discount rate is a very important work in finacncial analysis of BOT projects. d=14% (9% is risk free intrest, and 5% is risk primium) in equity perspective. E_j is equity drawing in the jth year of construction. β_m is the net annual cash available in mth year during operation. C_p is construction period. O_p is operation period.

（2）、Internal Rate of Return (IRR)

IRR is the discount rate in case of NPV=0. IRR is calculated in equation (22).

$$f(IRR) = -\sum_{j=1}^{c_p} \frac{E_j}{(1+IRR)^{j-1}} + \sum_{m=1}^{O_P} \frac{\beta_m}{(1+IRR)^{m+c_p}}$$

$$= -\sum_{j=1}^{c_p} \frac{\gamma_j \times X_j + EDC_j + IDC_j}{(1+IRR)^{j-1}} + \sum_{m=1}^{O_P} \frac{R_m - OM_m - DEP_m - TAX_m + \frac{TPC}{O_P} - (1-\gamma)\times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N} - 1}}{(1+IRR)^{m+c_p}} = 0$$

for $j=1,2,...C_p$ for $m=1,2,.. O_p$ (22)

In case IRR is larger than the expected rate of return or cost of capital, it implies that NPV > 0. The project is acceptable. In this study, IRR needs to be large than 14%.

（3）、Annual Debt Service Coverage Ratio (ADSCR)

ADSCR is used to measure the cash flow in every year which is enough to pay for the due installment. In general, DSCR >1 , the preferable range of bankable projects is between 1.10~1.25. ADSCR>1.5 is used in this study.

$$ADSCR_m = \frac{PBIT_m + DEP_m - TAX_m}{ADI_m} = \frac{R_m - OM_m - TAX_m}{(1-\gamma)\times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N} - 1}} \quad \text{for } m = 1,2,.....O_p \qquad (23)$$

Where $PBIT_m$ is the profit before interest and tax at the mth year during operation. TAX_m is the tax in mth year in operation period. DEP_m is the depreciation in mth year. ADI_m is the annual debt installment for mth year during operation.)。

（4）、Average Times Interest Earned, (ATIE)

This index is to reflect the ability of loan return. In case ATIE is higher, that means that the quality of loan return is good. The bank may have more willing to provide more fund to investors. ATIEis large than 1.5. And, it can be calculated in equation (24).

$$ATIE_m = \frac{PBIT_m}{ADI_m} = \frac{R_m - OM_m - DEP_m}{(1-\gamma)\times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N} - 1}} \quad \text{for } m = 1,2,....Op \qquad (24)$$

Where $PBIT_m$ is the profit before interest and tax at the mth year during operation. ADI_m is the annual debt installment for mth year during operation.

（5）、Average Return On Assets, (AROA)

This index is to reflect the rate of return for asset. In general, AROA is preferable to large than 10%. The value of AROA can be calculated in equation (25).

$$AROA_m = \frac{(PBIT_m - TAX_m) + ADI_m}{TPC} = \frac{(R_m - OM_m - DEP_m - TAX_m) + (1-\gamma) \times BC \times \frac{r(1+r)^{R_N}}{(1+r)^{R_N} - 1}}{BC + TEDC + TIDC}$$

for m=1,2,...O_p (25)

Where $PBIT_m$ is the profit before interest and tax at the mth year during operation. ADI_m is the annual debt installment for mth year during operation.

（6）、Average Return On Equity, （AROE）

AROE is to reflect the rate of return of equity holders. AROE needs to between 10%-15%. 13% is used in this study as shown in equation (26).

$$AROE_m = \frac{(PBIT_m\text{-}TAX_m)}{\sum E_j} = \frac{(R_m\text{-}OM_m\text{-}DEP_m\text{-}TAX_m)}{\sum E_j}$$

for m=1,2,...O_p (26)

Where $PBIT_m$ is the profit before interest and tax at the mth year during operation.

(4). Theory of linear programming

Linear programming is a very powerful tool in analyzing the optimum solution of objective function under conditions of resources constrains. A linear programming model is applied in this study in order to calculate the maximizing IRR.

$$\text{Maximize} \quad IRR = f(e) \tag{27}$$

Subject to

$$\begin{aligned} & NPV \geq 0 \quad or \quad IRR_{\min} \geq 14\% \\ & ADSCR_{\min} \geq 1.5 \\ & \vdots \\ & \vdots \\ & AROE_{\min} \geq 0.13 \end{aligned} \tag{28}$$

3. Empirical Study –Case study

■ Step 1 in PFEM model

First step is to establish the basic data and parameters. With these fundamental data, a 3/7 capital structure is assumed in analyzing the financial feasibility of BOT projects. Data of a hydraulic power plant in Turkey [12] is used to calculate the cash flow and accumulated cash flows. The construction cost is 132,565K US$. Civil works is 95,370K US$, M&E is 26,333K US$. Contingency is 3,092K US$（10% of civil works. 5%of M&E）. Additional expenditure is 7,770 K US$（including insurance, land acquisition, office fee, etc.）. Construction period is 4 years. Construction progress is 12.5%、27.5%、30%及 30%. Annual production of electricity is 405.8GW.h. Uav=4.75 Cents/KW.h，Operation cost is assumed 3~4% of M&E cost (3%is 790,000 US$）. Other data are r=10%, repayment period is 10 years.

Grace period =construction period=4 years. Operation period is 20 years.

Table 1 Data and parameters of case study

Data and parameters	Amount	Remarks
1. Cost in construction period		
Civil works	$95,370,000	
M&E works	$26,333,000	
Contingence	$3,092,000	10% of civil works. 5%of M&E
Additional fee	$7,770,000	including insurance, land acquisition, office fee, etc.
合計	$132,565,000	
2. Cost in every year		
First year	$16,571,000	Construction progress=12.5%
Second year	$36,455,000	Construction progress =27.5%
Third year	$39,770,000	Construction progress =30.0%
Fourth year	$39,770,000	Construction progress =30.0%
Sum	$132,565,000	
3. Uav	4.75 Cents/KW.h	。
4. Operation and maintenance cost	$790,000	3~4% of M&E cost
5. Loan conditions		
Interest rate of loan	10%	
The repayment year	10yr	Start from the first year of operation period.
Grace period	4yr	Equal to construction period
Operation period	20yr	
Inflation rate	4.1%	

Use equations (12), (18), (20) and Uav to calculate the DEP_m, U_1, and U_2. In case of γ=30%, DEP_m, U_1, and U_2 are in table2. The hurdle rate of six profitability indices are calculated and list in table 3. The cash flow of the project is shown in figure 1 and accumulated cash flow is in figure 2. The final results of six profitability indices is in Table 4.

Table 2 In case of γ= 30%, U_1, U_2 and DEP values

Item \ year	1	2	3	4	5	6	7	8	9	10	11-20
1. Depreciation	$8,156,000										
2. Annual OM cost	$790,000										
3. U_1	9.09	8.64	8.20	7.79	7.40	7.03	6.68	6.35	6.03	5.73	--
4. U_2	--	--	--	--	--	--	--	--	--	--	2.20

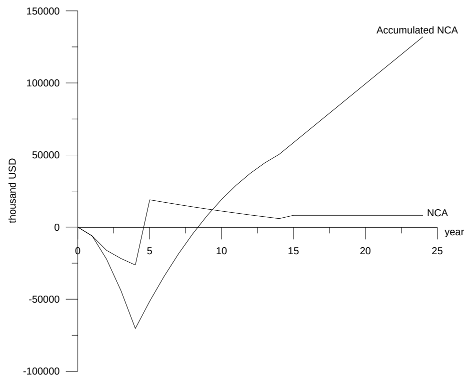

Figure 1 In case of γ=30%, The cash flow of the project

Table 3 Hurdle rate of six profitability indices

NPV	IRR	ADSCR	ATIE	AROA	AROE
≧0	≧14%	≧1.5	≧1.5	≧10%	≧13%

Table 4 In case of γ=30%,, the calculated value of six profitability indices.

NPV	IRR	ADSCR	ATIE	AROA	AROE
7025≧0	14.17%≧14%	1.91≧1.5	1.46≦1.5	10.30%≧10%	12.84%≦13%

The results show that in case of γ=30% the ATIE and AROE can not meet the requirement of hurdle rates. Second step analysis is required.

- Second step of PFEM model

In case that the 3/7 capital structure case can not meet the requirement of hurdle rate, a sensitivity anaysis is conducted to investigate various capital structure, such as In case of γ= 0%、25%、50%、75%、100%. Figure 2 shows the cash flow for various γ and figure 3 demonstrates the accumulated cashflow for various γ.

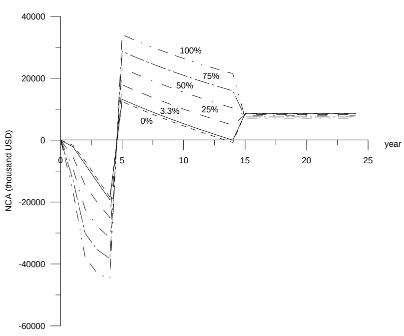

Figure 2 The cash flow for various γ

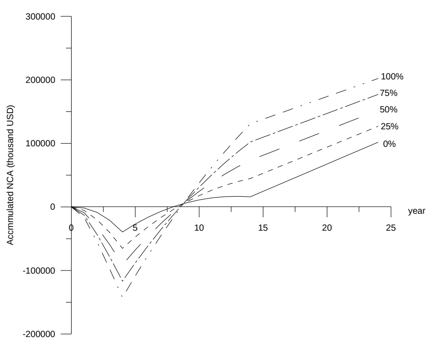

Figure 3 The accumulated cash flow for various γ.

Some results can be found in figure 2.

1. Cash flow reaches a peak at the first year in operation period. Cash is decreased monotonically after the first year. 14 year later, cash flow maintains a steady cash flow which due to the condition of $PBIT_m=0$.
2. The fourth year spends most money in various γ.
3. In case of γ≧3.3%, NCA is positive. That is if γ is less than 3.3, then there is a possibility of defaults.
4. Payback period is around 7.8~8.6years.

- Third step of PFEM model

The third step is to established the relationship between γ=20%~60% and six profitability indices respectively. Two commercial packages of regression analysis software are used which are SPSS and GRAPHER. The results of NPV、IRR、DSCR、ATIE、AROE、AROA versus γ=20%~60% are shown in Figure 4~9.

- Fourth step of PFEM model

The fourth step of PFEM model is to apply linear programming for calculating the optimum capital structure for the BOT projects. Two perspectives are considered; first is equity perspective, second is the banker perspective. In equity holder perspective, the IRR maximum is the object function. In banker perspective, ADSCR maximum is major concerns to the loan providers. With regression in figure 4~9, a LP model is established as shown in below.

```
Object Function   Maximize IRR
                   MAX=-0.0002555635849*X1+0.1507031531;
 Subject to
              -3.124851279*X1+7130.66866>=0;
              -0.0002555635849*X1+0.1507031531>=0.14;
              0.03789897864*X1+0.6742080701>=1.5;
              0.1006596633*X1+1.346534933>=1.5;
              -0.0004355574913*X1+0.1176393728>=0.1;
              -0.001476515679*X1+0.1807289199>=0.13;
              X1>=20;
              X1<=60;
              END
```

A lingo program is used to calculate the optimum capital structure. The results show that IRR maximum is equal to 0.145；γ_{op}=21.79%.

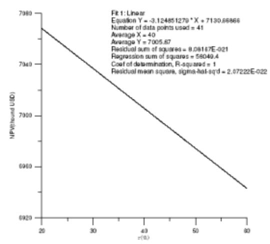
Figure 4 NPV vs. γ=20~60%

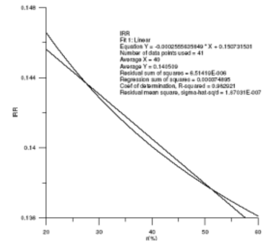
Figure 5 IRR vs. γ = 20~60%

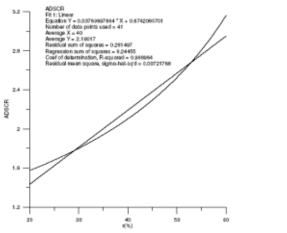
Figure 6 ADSCR vs γ = 20~60%

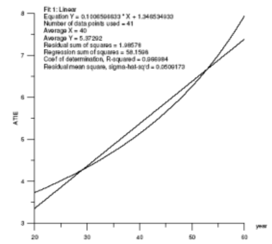
Figure 7 ATIE vs.γ = 20~60%

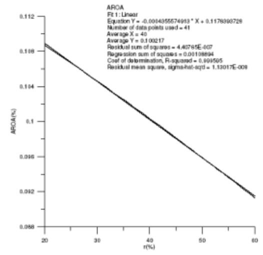
Figure 8 AROA vs. γ = 20~60%

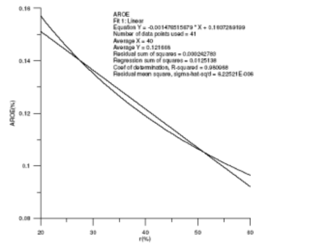
Figure 9 AROE vs. γ = 20~60%

Loan providers, banks, are prefer to see IRR maximum. They also wish to see ADSCR maximum. Therefore, a study with considering ADSCR maximum is also calculated. In this case, γ_{max}=34.36%.

```
Object function   Maximize
                  MAX=0.03789897864*X1+0.6742080701;
Subject to
          -3.124851279*X1+7130.66866>=0;
          -0.0002555635849*X1+0.1507031531>=0.14;
          0.03789897864*X1+0.6742080701>=1.5;
          0.1006596633*X1+1.346534933>=1.5;
          -0.0004355574913*X1+0.1176393728>=0.1;
          -0.001476515679*X1+0.1807289199>=0.13;
          X1>=20;
          END
```

Some interesting results are found that in a win-win situationγ_{op}=21.79%~γ_{max}=34.36%. In this range both parties are happy with values of their own profitability indices. Figure 4~9 also shows the followings:

1. In figures 4, 5, 8, 9, increasing γ will cause decreasing of NPV、IRR、AROA、AROE values.
2. Figure 8 shows that increasing γ will result in increasing ADSCR and ATIE. This means increasing γ can reduce the risk of bankers.
3. γ=20~60%,the regression analysis show that R-Squared are more than 0.97.

Table 5 The profitability indices in case of γ=21.79%~34.36%

γ	NPV	IRR	ADSCR	ATIE	AROA	AROE
21.79%	7063≧0	14.58%≧14%	1.61≧1.5	3.83≦1.5	11%≧10%	15.3%≦13%
34.36%	7023≧0	14.16%≧14%	1.92≧1.5	4.66≦1.5	10%≧10%	13.0%≦13%

4. Conclusions

With the case study, some conclusions can be reached.

- The proposed model, PFEM, can be used to determine the optimum range of capital structure of BOT projects.
- With the figures of NCA vs. γ, the minimumγ_{min}=3.3%. In case the investors provide the fund is less than 3.3%. Then, it is some possibility of defaults. Bankers will regards that these cases are non-bankable.
- Figure 3 shows that the payback period is between 7.8~8.6 years, no matter the value of γ.
- In figure 4~9, increasing γ will result in the decreasing NPV、IRR、AROA、AROE. Increasing γ will result in the increasing ADSCR and ATIE.
- γ=20~60%, the regression line between six profitability indices and γ are shown good fitting. The R^2 are over 0.97.
- With two different perspectives, a range of γ_{op}=21.79%~γ_{max}=34.36% is found. This range can use for negotiation for both party in discussion the loan.

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