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RETURNS AND FISHERMEN INCOME IN THE ARTISANAL FISHERIES : A REVIEW

by

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INTRODUCTION

Investment decision in the artisanal fisheries is a complex process involving a number of parameters (biological, economic) which are not known with certainty. Net investment is an effort capacity increase, so investment policy plays a major role in the fisheries management policy. Charles (1986) has pointed out the influence of the unit cost (including the cost of capital) on fisheries activity.

In this study, capital budgeting methods are used to evaluate the investment projects. The first section recalls the cash flows calculation applied to artisanal enterprises. The consequences of the share system and public subsidies on the capital budgeting criteria are examined in section 2 and 3.

1. CAPITAL BUDGETING CRITERIA APPLIED TO ARTISANAL FISHERIES

The capital budgeting criteria (net present value, payout time, internal rate of return) are well known as tools to evaluate the investment projects (Bridier and Michaïlof, 1987). To apply these economic criteria in the artisanal fisheries requires to consider the income sharing system between the shipowner and the fishermen.

The total expenditures of a fishing trip, which do not include wages, are divided in two parts : the running costs directly related to the fishing trip (C_R) and the vessel cost (C_F) related to the ship (maintenance, insurance,...). The owner is responsible for the vessel costs. The running costs

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are shared between the owner and the crew. Wages (W), and the owner's return (F), are calculated as follows :

$$W = s\ (R - C_R) \tag{1}$$

$$F = (1 - s)\ (R - C_R) - C_F \tag{2}$$

where R represents the gross earning of the fishing trip and s is the crew's share.

If we consider that the ship-owner invests at time 0 (I_0) and has a fishing activity from time 1 to time n, the net present value of the cash-flow (NPV) on (n+1) periods is given by :

$$NPV = - I_0 + \sum_{t=1}^{n} \frac{(1 - s)\ (R(t) - C_{R(t)}) - C_{F(t)}}{(1 + i)^t} \tag{3}$$

where i is the discount rate.

At this point two remarks are necessary :

- First, the previous formula of NPV ignores inflation. This problem is important for computation but doesn't change the core of the argument.

- Second, the above equation (3) gives a net present value ignoring taxation.

From equation (3), we can calculate the constant unit cost (P_C) which equalizes NPV to 0. If we note that the gross earning (R) is the product of the price (P_C) by the landings (Q(t)) :

$$R(t) = P_C \cdot Q(t)$$

we obtain :

$$P_C = 1/(1-s)\left[\frac{I_0}{\sum \frac{Q(t)}{(1+i)^t}}\right] + 1/(1-s)\left[\frac{\sum \frac{C_{F(t)}}{(1+i)^t}}{\sum \frac{Q(t)}{(1+i)^t}}\right] + \left[\frac{\sum \frac{C_{R(t)}}{(1+i)^t}}{\sum \frac{Q(t)}{(1+i)^t}}\right] \tag{4}$$

The unit cost has three components : the investment per unit of landed quantity, the per unit vessel and running costs. As s grows, 1/(1-s) is higher and the part of the running costs per unit becomes smaller. The income sharing system reduces the relative influence of the running costs which are generally the

most variable expenditures. We will develop this topic in section 3.

2. INVESTMENT FINANCING

Investment in vessels and gears is financed by loans and the owner's equity. In some countries, as the EEC countries /1/, subsidies are a third source of financing.

Three approaches can be used to calculate the net present value : overall return, return on equity and the shadow interest method. These approaches have been analyzed and compared by Babusiaux and Karnik (1986) and Babusiaux (1989). In this section, we only present the basic results - overall return and return on equity - applied to the artisanal enterprises.

Overall return doesn't consider the investment financing structure. The cash-flow calculation doesn't include the loan flows (loan drawing, reimbursments) and the subsidies. This approach is the first approach of the Government or the Administration in charge of the fisheries development who wants to study the project profitability before deciding the level of subsidies.

From equation (2), the cash-flow can be expressed as :

$$F_G = (1 - g)\ ((1 - s)\ (R - C_R) - C_F) + g.A \qquad (5)$$

where g is the tax rate and A is the depreciation. Also, the net present value can be written as :

$$NPV_G = - I_0 + \Sigma\ \frac{F_{G(t)}}{(1 + i_G)^t} \qquad (6)$$

Return on equity includes the flows of loan repayment and the subsidies in the cash-flow calculation. This approach will be used by enterprises which want to calculate these net earnings. Babusiaux (1989) has shown that F_G (overall return cash-flow) and F_E (return on equity cash-flow) are linked by the following relationship :

$$F_E(t) = F_G(t) - (1 + b(1 - g))\ L(t-1) + L(t) \qquad (7)$$

/1/ For France, the investment financing in fisheries has been analyzed by J. Catanzano (1988) - Eléments sur les interventions financières de l'Etat dans le secteur des pêches artisanales . Ifremer, mimeo déc. 1988.

where L(t) is the remaining borrowed capital at time t and b is the rate of interest. The net present value is therefore :

$$NPV_E = - I_0 + S_0 + \Sigma \frac{F_{E(t)}}{(1 + i_E)^t} \qquad (8)$$

where S_0 is the investment subsidy.

The classical result of equality between NPV_E and NPV_G requires that $i_E = i_G = b(1 - g)$ (net after tax cost of the loan) will not be satisfied for zero subsidy.

NPV_E increases with S_0, so that from a given level of subsidy, NPV_E can always be greater than NPV_G for a non negative discount rate (figure 1). This level of subsidy is given by the equation :

$$S_0 = \Sigma \frac{(1 + b(1 - g))\, L(t-1) + L(t)}{(1 + i)^t} \qquad (9)$$

3. INCOME SHARING

The validity of capital budgeting methods is limited because of the variability of the natural resources exploitation. Chareton and Bourdaire (1985) present a general view of the project evaluation criteria with uncertainty.

In fact, the income sharing can be considered as a risk sharing (Platteau, 1989). The gross earning variability (catches uncertainty, landing prices fluctuation) and the running costs variability (gasoil prices variation) are shared between the ship-owner and the crew.

From equation (2), if we assume that the vessel costs have no variance, the cash-flow variance can be written as :

$$Var(F) = (1 - s)^2\, Var(R - C_R) \qquad (10)$$

The cash-flow (F_p) of a plant with the same level of income (R_p), operation costs (C_{Rp}) and fixed costs (C_{Fp}) but with fixed wages (W_p) can be written as :

$$F_p = R_p - C_{Rp} - C_{Fp} - W_p$$

so, with constant C_{Fp} and W_p, the cash-flow variance is :

$$Var(F_p) = Var(R_p - C_{Rp}) \qquad (11)$$

Comparison between (10) and (11) shows that the cash-flow of the small scale fishing enterprise is less sensitive to income and operation costs levels, than the cash-flow of the plant.

For instance, if the operation costs are proportional to the gross earning (with the same coefficient in the fisheries enterprise and in the plant), the ratio of the two variances becomes :

$$\frac{Var(F)}{Var(F_p)} = (1 - s)^2 \frac{Var(R)}{Var(R_p)} \qquad (12)$$

Therefore, since Var(R) is less than $1/(1 - s)^2$ Var(R), for s>0 the cash-flow variance is smaller in the artisanal fishing enterprise.

CONCLUSION

The main issue of this review of the capital budgeting criteria is that the income sharing between the shipowner and the fishermen reduces the cash-flow variability.

Capital budgeting provides useful decision criteria for investment but doesn't consider the general conditions of the fishery exploitation which has to be studied before. Sensitivity analysis could be used to test the consequences of several exploitation patterns.

As income sharing reduces the cash-flow variability, it increases the crew income variability. So, the project evaluation requires a wage calculation : the fishermen's income is variable as much as the industrial wages are stable.

The capital budgeting criteria do not apply to operation when both the roles of crew and owner are merged. In this case, the fisherman is the shipowner, and profits and wage cannot be separated.

REFERENCES :

Babusiaux D. (1989) : Rentabilité globale, rentabilité des capitaux propres et méthode des intérêts seulement déductibles, Economie et Société, Sciences de Gestion n°13, nov. 1989, pp. 29-54

Babusiaux D., Karnik J.L. (1986) : Sur la prise en compte du mode de financement dans les calculs de rentabilité : la méthode des intérêts seulement déductibles, Revue de l'IFP, Vol.41, n°3, mai-juin 1986

Bridier M., Michaïlof S. (1987) : Guide pratique d'analyse de projets, Economica, Paris, 4ème éd., 1987

Charles A.T. (1986) : Coastal state fishery development, Foreign fleets and optimal investment dynamics, Journal of development Economics, 24, pp. 331-358

Charreton R., Bourdaire J.M. (1985) : La décision économique, PUF, Collection que sais-je?, Paris 1985

Platteau J.P. (1989) : la contribution de la nouvelle économie institutionnelle pour l'analyse des relations contractuelles et des formes organisationnelles dans le secteur de la pêche maritime, Communication au symposium pêche artisanale, Montpellier, 3-7 Juillet 1989

FIGURE 1 : Net Present Value