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# INVESTMENTS' EVALUATING METHODS IN SHIPPING – A COMPARISON STUDY BETWEEN THE NEWBUILDING VERSUS THE SECONDHAND VESSEL PURCHASE

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**Abstract.** Enterprises often come before the vital decision of selecting the proper investing project. For shipping enterprises the decision of acquiring a vessel is so crucial as the survival of the company, since the vessel may not merely be an asset but the whole business itself. Investments' evaluating methods are presented in this paper, after they have been analyzed and adjusted to meet the requirements and the circumstances of the shipping industry. The aim of this paper is to aid the final decision of the ship-owner or the prospect investor, by bringing out the advantages and disadvantages of each method and emphasizing the necessity of a thorough evaluation of investment planning, based on the application of one or more of the proposed methods. Conclusively, the evaluation procedure of an investment in Shipping could not be reliable by the application of one – specific evaluating method. The alternative investing projects, the economic circumstances and the market status in the specific time, will determine which of the presented methods should be applied to reach the right decision. On the other hand, the banks are interested in securing the repayment of the capital they lend.

**Keywords:** Investments' evaluating methods, Risk & return, Newbuilding, Secondhand.

# 1. INTRODUCTION

Companies often face the problem of asset replacement when a specific asset does not operate efficiently. A sound program of replacement analysis can ultimately affect the financial success of an enterprise. When replacement decisions are being considered there are two courses of action available. The first possibility is to retain the asset presently owned for an additional period of time. The other alternative requires the immediate removal of the existing asset with its subsequent replacement by another asset. A thorough study of comparison of all the economic values of the two alternatives is necessary before the final decision.

Because of the sensitive and changeable globalize environment of the shipping industry the evaluation of every investment project might take into consideration the high risk of the sector, the limitation of capital and the selection between alternatives of unequal lives. This article will focus on the last factor, the evaluation of unequal lives' alternative investments.

The two important terms that are commonly used in replacement studies and are widely accepted by practitioners involved in replacement analysis are:

I. *Defender*: The existing old asset considered as the asset to be replaced.

II. *Challenger*: The asset proposed to be the replacement. [1]

The major decision a shipping company will be facing is the acquisition of a vessel. The potentiality of the following options, buying a vessel from the "Secondhand vessel market" or build a new in the shipyard, requires beforehand a comparison study of the two alternatives.

Applying the "theory of replacement" in the shipping company, we consider the "Defender" to be the "Secondhand" vessel, since it is assumed to be the old asset that is to be replaced, and the "Challenger" to be the "Newbuilding" since it is threatening to displace the older (secondhand) vessel.

The economic characteristics of the "Defender" and the "Challenger" are usually very dissimilar and therefore special attention is required when these two options are compared. One obvious feature of replacement alternatives is that the duration and the magnitude of cash flows for old existing assets and new assets are quite different. New assets characteristically have high Capital costs and low Operating costs. The reverse is usually true for assets that are

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[1] Thuesen H.G, Fabrycky W.J., Thuesen G.J., *Engineering Economy* (Englewood Cliffs, N.J.: Prentice-Hall, 1977), p. 211

considered for retirement.[2] Thus, Capital costs for an asset to be replaced may be expected to be low and decreasing while Operating costs are usually high and increasing. The remaining life of an asset can be estimated with relative certainty.

In the classic case of replacement, that is when one asset might be replaced by another, *Physical impairment* and *Obsolescence* are the two basic reasons for replacement. *Physical impairment* and *Obsolescence* may occur independently or they may occur jointly in regard to a particular asset. *Physical impairment* and *Obsolescence* are factors to be taken into consideration in the case where the enterprise has to decide whether to use a "Newbuilding" or a "Secondhand" vessel.

*Physical impairment* refers only to changes in the physical condition of the asset itself. It may lead to a decline in the value of service rendered, increasing operating cost, or a combination. *Obsolescence* is used here to describe the effects of changes in the environment external to an asset. It occurs as a result of the continuous improvement of science and technology. Often, the rate of improvement is so great that it is an economy to replace a physical asset in good operating condition with an improved unit. These two factors should be studied in every replacement problem, even when a choice is to be made between two assets of unequal lives.

Replacement should be based on economic factors. When the success of an economic venture is dependent upon profit, replacement should be based upon the economy of future operation. The economic future of the alternative investments, the "Newbuilding" and the "Secondhand" must be calculated using one or more of the evaluating methods.

The *Net Present Value*, the *Internal Rate of Return*, the *Incremental Analysis*, the *Cost/Benefit Ratio* and the *Cost per ton of cargo* are the methods that will be presented in this paper.

## 2. EVALUATING METHODS OF ALTERNATIVE INVESTMENTS

### I. Net Present Value Theory

The technique of discounting a cash flow stream at appropriate discount factors for the levels of risk is called The Net Present Value method. The original investment in the asset is

[2] Drewry H.P *Investment opportunities in Secondhand Tonnage* , A Review of profitability 1991/1996 and prospects 1996/2001., London, 1996

the Present Value of the Net Cash Outlay (PVNCO). The current value of the cash flow stream is the Present Value of the Net Cash Benefits (PVNCB). Under the Net Present Value method, we compare the PVNCO and the PVNCB, for each asset and therefore we can see which asset yields a higher return.

The Net Present Value Theory can be applied to any kind of investment. An investor, who is placing his money on a table, will not have access to it as long as it is on the table. Someone else will use it until the investor removes it from the table. It is obvious that an investor who puts his money on the table is expecting a "meter" to be running the whole time the money is on the table. If for example, the meter is set at 10% for a period of two years, at the end of the second year the investor will receive the amount that he placed on the table (Principal) plus the 10 % for 2 years (interest). Four symbols will be introduced which will be used in calculating the NPV.

$n$: The number of years the money is invested.

$i$: Interest rate per year.

$PV$: The Present Value of the money invested.

$FV$: The Future Value of the money invested. That is the value of the money after $n$ years at $i$ percent per year.

The process of reducing a future sum [ $FV = PV \times (1+i)^n$ ] to its present value by

taking away the interest rate is called *Discounting*

$$1)\ PV = \frac{FV}{(1+i)^n} \qquad (1)$$

Once we know the amount on the table (PVNCO), we can consider getting the money back off the table (Principal payment) and can determine the meter rate (rate of return). To do this, we must identify the cash inflows each year during the service life of a project. Once these are identified they must be brought back to present value. The discount factor $i$, which is the rate of return on the stream, sets the Present Value of the Benefits (PVNCB) equal to the Present Value of the Cash Outlay (PVNCO). The process of setting the Net Cash Outlay equal to the Net Cash Benefits may be expressed mathematically by the formula:

$$PVNCO = \sum_{t=1}^{n} \frac{NCB_t}{(1+i)^t} \qquad (2)$$

$PVNCO$ : Present Value of the Net Cash Outlay in period zero (delivery of the vessel)

$\sum_{t=1}^{n}$ : The sum of values from the first time period to the $n^{th}$

$NCB_t$ : Net cash benefit in period $t$.

Although this formula is widely used, the analyst should consider that the first benefits do not occur until year one. Other formulas will be used in calculating PVNCO and PVNCB depending on the time the payments are made or the benefits will be received.

When the return of the investment consists of several amounts received at different times, the formula is:

$$PVNCB = \frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + \text{-----} + \frac{R_n}{(1+i)^n} + \frac{SV}{(1+i)^n} \qquad (3)$$ [3]

$R_1, R_2, R_3, .. R_n$ : Returns for years *1,2,3, .... n.*

$i$ : Interest rate.

$SV$ : Scrap Value at the end of the vessel's life.

If the returns that will be received at different times are of equal amounts $(R_1 = R_2 = R_3 = .... R_n)$, the formula will be:

$$PVNCB = R\left\{\frac{1 - \frac{1}{(1+i)^n}}{i}\right\} + \frac{SV}{(1+i)^n} \qquad (4)$$ [4]

Knowing the PVNCB and the cost of the asset, we are able to calculate the Net Present Value.

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[3] R. Pelicciaro, *Financial Markets and Institutions*, Maritime College, N.Y. 1982. p.67
[4] Ibid. p. 70

$$NPV = PVNCB - PVNCO \qquad (5)$$

$$NPV = PVNCB - C_0 \qquad (C_0 = \text{Total Cost at present time, i.e. year 0}) \qquad (6)$$

Formula (6) can be used when the cash benefits are adjusted to the same time the cost of the vessel is paid. If the cost is paid in installments at different times, another formula will be used to calculate the Present Value of Cash Outlays. When the cost is paid in installments of unequal amounts, before delivery of the vessel, PVNCO will be calculated:

$$PVNCO = D_1(1+i)^n + D_2(1+i)^{n-1} + D_3(1+i)^{n-2} + .... + D_{n-1}(1+i)^1 + D_n \qquad (7)$$

$D_1$ : The first payment which was paid n years before delivery of the vessel

$D_n$ : The last payment, paid upon delivery of the vessel

Formula (7) will apply rather for the Newbuilding which takes time to be delivered. If payments are monthly the formula will be transformed to:

$$PVNCO = D_1\left(1+\frac{i}{12}\right)^{12n} + D_2\left(1+\frac{i}{12}i\right)^{12(n-1)} + D_3\left(1+\frac{i}{12}\right)^{12(n-2)} + .... + D_{n-1}\left(1+\frac{i}{12}\right)^{12} + D_n \qquad (8)$$

Shipowners usually invest an equity of approximately 20 to 30 percent of the total cost of the vessel and the bank finances the remaining amount. That means that upon the time of delivery the owner had already paid the equity in one or several installments and for the borrowed capital he will have to pay the bank after the vessel's delivery. A more detailed formula which will include the calculations for installments before delivery (D) and the payments after delivery (P).

$$PVNCO = D_1(1+i)^n + D_2(1+i)^{n-1} + D_3(1+i)^{n-2} + .... + D_{n-1}(1+i)^1 + D_n +$$

$$+\frac{P_1}{(1+i)} + \frac{P_2}{(1+i)^2} + .... + \frac{P_n}{(1+i)^n} \qquad (9)$$

The second part of formula (9) is the cost of the vessel minus the equity; but having all the bank payments instead of a total amount, provides the possibility to calculate the *NPV* at any year after delivery of the vessel. Finally, formula (5) can be replaced by the following detailed formula, after substituting its first part with formula (3) and the second with formula (9).

$$NPV = \left[\frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + ... + \frac{R_n}{(1+i)^n} + \frac{SV}{(1+i)^n}\right] -$$

$$\left[D_1(1+i)^n + D_2(1+i)^{n-1} + ... + D_n + \frac{P_1}{(1+i)} + \frac{P_2}{(1+i)^2} + ... + \frac{P_n}{(1+i)^n}\right] \qquad (10)^5$$

In case of equal Returns $(R)$, the first part of the formula may be substituted by formula (4). Likewise, in case the total cost of the vessel is paid in one installment, the second part of the formula may be substituted by $C$ (cost). Likely, if no payment is paid to the seller before delivery, the part of the formula calculating these installments will be omit ($D$ calculations).

With the Net Present Value theory we are able to calculate the real value of each asset (vessel), since all the cash outlays and the cash inflows are discounted to the present time (year 0) by the interest rate r, which reflects the profitability required by the investor. Assuming that r represents the opportunity cost, the calculated Net Present Value represents the surplus, at market price, the company may earn, by selecting the specific project instead of securing a capital yield equal to r.

## II. Internal Rate of Return Method

An alternative method of examining the value of an investment, as it is the vessel's acquisition, is the Rate of Return. Before analyzing the use and the application of this method, an introduction to the Risk and Return theory may be necessary for a global comprehension of the transactions' evaluation.

*Risk* may be defined as the probability that the actual Return from an investment will be less than the expected Return.[6] The investor who is evaluating the purchase of a vessel, for example, estimates a 10 percent return, but there is a 10% chance of a 9 percent return if operating costs rise unexpectedly and a 10 % chance of 11 percent return if operating costs drop. Risk can be measured with a probability distribution, which is defined as the probability estimates associated with different future outcomes. A more formal process of measuring risk in an investment proposal is the Standard Deviation, which is defined as a measure of the dispersion of returns that approximate a normal probability distribution. Every investor ought

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[5] Elaborated by the author M. Diakomihalis

[6] John J. Hampton, *Evaluating Shipping Transactions*, New York, N.Y., The World Trade Institute, 1979, p.209

to know the degree of risk that he is undertaking and the required rate of return, which is the minimum, expected return needed, so that investors will purchase and hold an asset.

The required Rate of Return is measured with the formula:

$$E(Rtrn)req = E(Rtrn)riskless + \frac{\sigma asset}{\sigma market}[E(Rtrn)market - E(Rtrn)riskless] \quad (11)$$

The required rate of return is equal to the riskless rate plus a premium that is determined by two factors:

1) The proportion of risk between the individual asset and the overall market ($\sigma$ asset / $\sigma$ market); and

2) The spread between the market rate of return and the riskless rate of return.

The standard deviation $\sigma$ is calculated with the formula:

$$\sigma = \sqrt{\frac{\sum_{j=1}^{n}[E(Rtrn)_1 - E(Rtrn)_{mean}]^2}{n-1}} \quad (12)$$[7]

where $\sum_{j=1}^{n}$ : the sum of all values

$E(Rtrn)_1$ : the actual return from the first proposal

$E(Rtrn)_{mean}$: the average of all the past actual returns

In this specific case of comparison, it is assumed that the return or the cash flows will be the same for both assets.

*Rate of Return= r*

*Cost of Capital= k*

$$C = \frac{R_1}{(1+r)} + \frac{R_2}{(1+r)^2} + \frac{R_3}{(1+r)^3} + --- + \frac{R^n}{(1+r)^n} \quad (13)$$

The Rate of Return method can determine whether an asset should be acquired or not, according to its yield (the value of r) that balances the equation (equalizes the NPV of cash inflows with the NPV of cash outlays). The acceptance or the rejection of the project, with the IRR method is based on the comparison of r with the required yield set by the investor k, that represents the opportunity cost. Projects yielding an r, which is smaller than k will be rejected.

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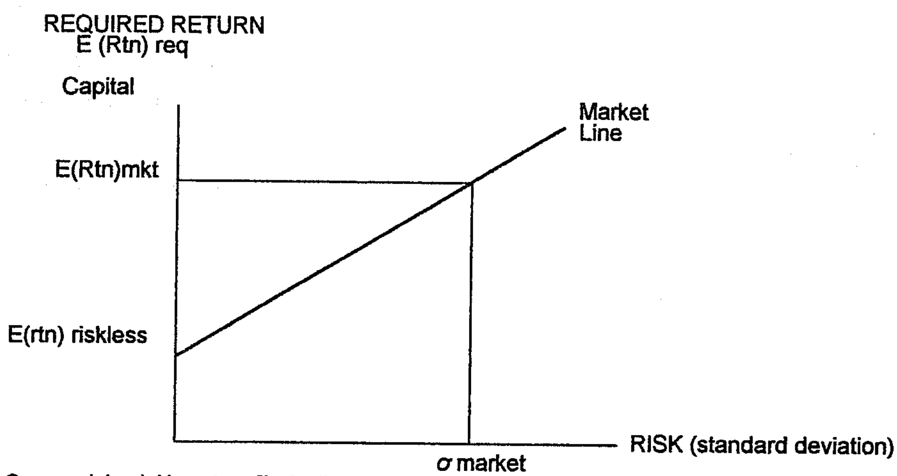
[7] Ibid p. 216

On the contrary, projects yielding r, greater than k will be accepted. In cases of equal values of r and k the investor is indifferent.

For equal returns we will use formula (4), substituting PVNCB by C, *i* by *r*, and omit the *SV* part. To calculate *r*, we must use the *trial & error* method, that is trying different numbers, f.e. 10%, 12%, 15%, 20%, e.t.c., until we come up with the value of *r* that makes the equation true.[8]

The required rate of return of an asset and its relationship with the riskless investment are shown in figures 1 and 2.

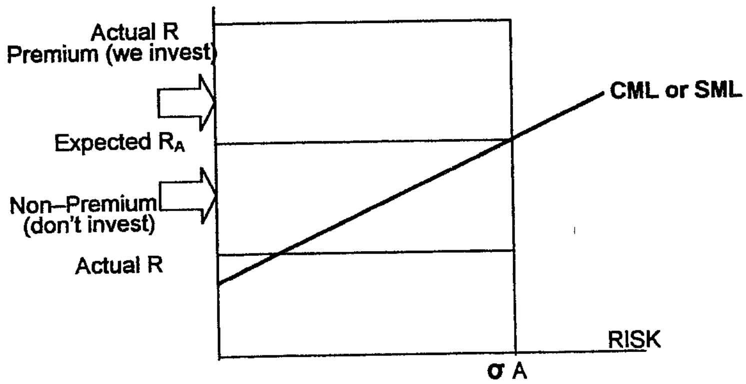
**Figure 1. "Capital Market Line and Required Return"**




Source: John J. Hampton, *Evaluating Shipping Transactions*, New York, N.Y.: The World Trade Institute, 1979, p. 242

[8] Goulielmos A.«Shipping Financing», Stamoulis' Publications, Athens 1998, p. 362

**Figure 2. "Capital Market Line or Security market Line"**

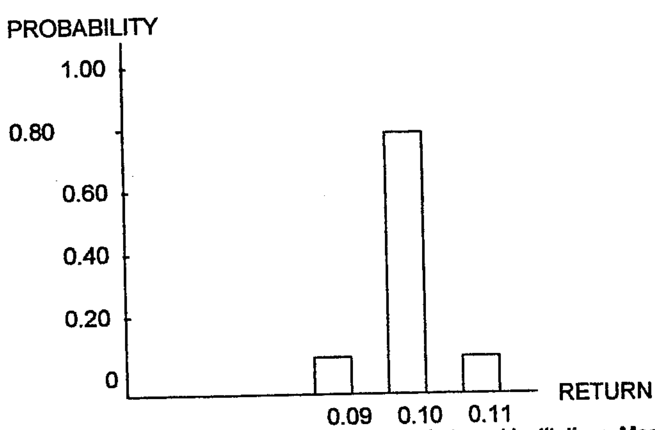



Source:Grigorios Gikas, Alina B Hyz, *Risk in investment appraisal*, Studia Kupieckie, 2000,p. 65

The Capital Market Line shows the relation between Risk and Return. Once the risk-return profile of an asset has been established, we compare the asset's return and risk with the Security Market Line. [9]

The following figure, 3., shows the probability distribution of the expected return of an investment.

**Figure 3., "Probability Distribution of Return" (example of page 7)**




Source: Source: Pelicciaro R., *Financial Markets and Institutions*, Maritime College, S.U.N.Y., N.Y., 1982, p. 203

[9] Grigorios Gikas, Alina B. Hyz, *Risk in investment appraisal*, Studia Kupieckie, 2000, p. 65

Knowing the probability of all the possible returns, we can calculate the expected return

$E(Rtrn)$: $$E(Rtrn) = (P_1 \times R_1) - (P_2 \times R_2) - \ldots - (P_n \times R_n) \qquad (14)[10]$$

## 2. OTHER METHODS OF ANALYSIS OF THE TWO ALTERNATIVES

### *Incremental Analysis*

It may be defined as the examination of the differences between alternatives. By doing so, we emphasize the fact that in choosing between alternatives we are really deciding whether or not the differential costs are justified by the differential benefits. The two alternatives are related as follows:

Higher cost Alternative = Lower cost Alternative + difference between them

Incremental analysis focuses on the differences between the rates of return of the two alternatives. Knowing the present worth (PW) of costs and the PW of benefits we can find the rate of return (r) as follows. For a short period investment (one year or less) the rate of return r will be calculated with the following formula. For cost x at year 0 and benefit y at year 1, r equals:

$$r = \frac{Benefit - Cost}{Cost} = \frac{y - x}{x} \qquad (15)[11]$$

For a long –term investment, formula (16) will be revised as follows:

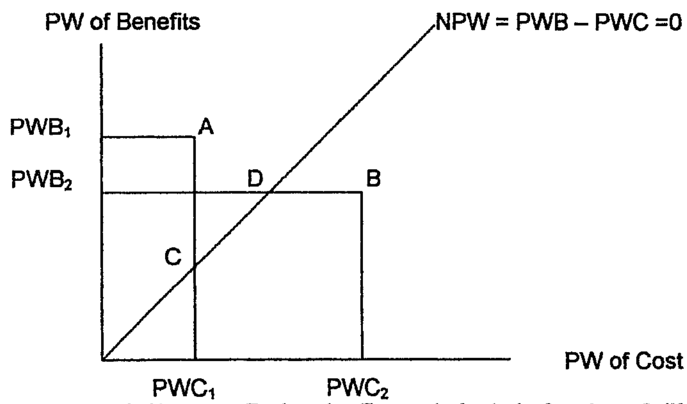
$$r = \frac{PW \;\; of \;\; Benefis - PW \;\; of \;\; Costs}{PW \;\; of \;\; Costs} \qquad (16)[12]$$

The PW and the Rate of Return can be calculated here with the Discount methods that have been introduced previously in this article. Incremental analysis can be illustrated with a Benefit –Cost figure, where the two axes are identical and the resulting NPW line is at a 45

[10] John J. Hampton , *Evaluating Shipping Transactions* ,The World Trade Institute, New York, N.Y. , 1979, p.210
[11] Donald G. Newman, Engineering Economic Analysis, San Jose California : Engineering Press, 1980,p. 149
[12] Ibid p. 150

angle. The NPW line is formed when PW of Cost equals PW of Benefits, or PW of Cost – PW of Benefits = 0

**Figure 4. "PW of Benefits vs. PW of Costs"**

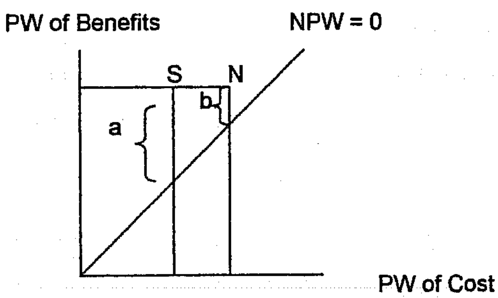



Source: Donald G. Newman, *Engineering Economic Analysis*, San Jose, California: Engineering Press, 1980, p.143

For a chosen discount rate $i$, the NPW=0 line, divides the graph into an area of desirable alternatives and undesirable alternatives. On the left (or above) of the line is the desirable area and on the right (or below) is the undesirable. It is obvious that for every point in the left to the line area, PWB is greater than PWC or that the NPW is positive. F.e. the PW of Benefits at point A exceeds the PW of Cost by the distance AC. The opposite is true for all points to the right of the NPW line. At point B f.e., the PW of Benefits is less than the PW of Cost by DB.

In the following figure 5, we compare the NPW of a Secondhand and a Newbuilding for an equal time period. F.e. we can compare the NPW of a 10 year old Secondhand (S) which has a 15 year useful life left, and a Newbuilding (N) with a 25 year useful life, either for the first year of their employment, or for the first five years of their employment and up to 15 years of their employment. This is so because the Secondhand has a remaining life of 15 years. Applying this method we become able to find which vessel (alternative) yields a higher Net Present Worth for a specific time period.

**Figure 5,** ***NPW of two alternatives of equal lives and returns***

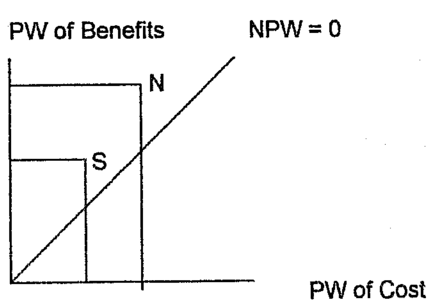



Source: Ibid, p. 143

According to the figure above, the PW of Benefits (the hire revenue) for the15- year useful life, will approximately be the same for the Newbuilding and the Secondhand. This can be true by accepting the hypothesis, that both, Newbuilding and Secondhand, will turnover the same sum of revenues, since they are operated in the same market and by the same owner. On the contrary, the PW of Cost will be higher for the Newbuilding and that is explained by the higher Capital Cost required to build a new vessel than purchasing a Secondhand. The difference in the NPW between the two vessels, appears in figure 5 as the distance of points S and N from the NPW=0 line, shown by the letters a and b.

Tthe following figure 6, shows the NPW or the rate of return r of two assets of unequal lives, over their lifetime.

**Figure 6,** ***NPW of unequal lives' assets***




Source: Ibid, p. 143

The NPW of the Newbuilding is greater than that of the Secondhand and that is explained by the difference in their useful life. The Newbuilding exceeds the lifetime of the Secondhand by 10 extra years.

The following method of analysis is very useful in comparing assets of unequal lives.

Assuming the assets are the Newbuilding and the Secondhand. Knowing their initial cost, their annual return, their useful life, their Scrap value and the required rate of return that is *i* for both vessels, the solution will be as follows:

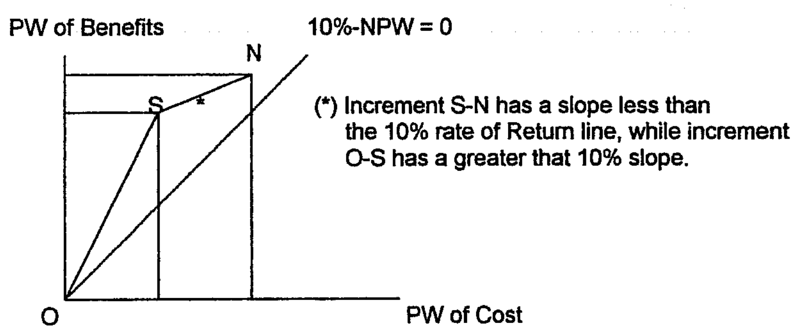
| YEAR | VESSEL S | VESSEL N | VESSEL N – VESSEL S |
|---|---|---|---|
| 0 | - Cost $S_A$ | – Cost N | -(Cost N - $S_A$) |
| 1 | $+R_{SA1}$ | $+R_{N1}$ | $(R_{N1}-R_{SA1})$ |
| 2 | $+R_{SA2}$ | $+R_{N2}$ | $(R_{N2}-R_{SA2})$ |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| 9 | $+R_{SA9}$ | $+R_{N9}$ | $(R_{N9}-R_{SA9})$ |
| 10 | $(+R_{SA10}+SV_{SA}-$ Cost $S_B)$ | $+R_{N10}$ | $(R_{N10}-(R_{SA10}+SV_{SA}-$ Cost $S_B)$ |
| - | - | - | - |
| - | - | - | - |
| 20 | $(+R_{SB20}+SV_{SB})$ | $(+R_{N10}+SV_N)$ | $(SV_N-SV_{SB})$ |

Source: Elaborated by the author M. Diakomihalis

$S_A$ stands for the first Secondhand vessel, whose useful life is 10 years, while the Newbuilding has a 20-year useful life. That is for by reaching the $10^{th}$ year we calculate not only the Return of both vessels, $S_A$ and N, ( $R_{SA10}$ , $R_{N10}$) but also the Scrap value of $S_A$ , ( $SV_{SA}$) since it is the last year of its useful life, and the Cost of Secondhand B (Cost $S_B$) which we should acquire and operate for the remaining 10-year useful life. The acquisition of $S_B$ is considered necessary in order to equalize the total life of the Secondhads with the total life of the Newbuilding.

The difference between vessel N and vessel S can be expressed in a percentage of return. Assuming that vessel S has a 10% rate of return; we will see how much we are benefiting by selecting vessel N instead of vessel S by comparing the difference in the rate of return between them. If the new percentage is greater than *i* (10%) we select vessel N; if it is equal to *i*, we are indifferent and if it is smaller than *i* we select vessel S. This can be seen graphically on the Benefit-Cost graph, below.

**Figure 7,** ***Benefit-Cost, Rate of Return Comparison***




Source: Ibid, p. 143

In the above example, we choose the S (secondhand) vessel, for it yields a greater than 10% NPV, which is the minimum rate of return required by the investor, and greater than the return of the vessel N (Newbuilding)

## *Benefit – Cost Ratio analysis*

At a given minimum rate of return we would consider an acceptable alternative provided PW of Benefits – PW of Cost ≥ 0. The Benefit-Cost ratio can be calculated and applied fro various problems, even when the two alternatives to be compared have unequal lives, as in the Incremental analysis. The same form of analysis used in the Incremental method, will be applied in the Benefit-Cost ratio analysis. The asset (or investment) with the higher Benefit-Cost ratio among the alternatives to be compared will be the selected one.

$$Benefit/Cost\ \ ratio = \frac{PW\ \ of\ \ Benefits}{PW\ \ of\ \ Cost} \qquad (17)$$

*The Cost per ton of cargo (mean cost ratio)*

This rate is calculated by dividing all indispensable Cost categories required to move the cargo (Capital, Operating, Voyage, Insurance, Administrating, e.t.c) over the gross tonnage of the vessel (Dwt). As mentioned earlier, charges that may be the same for both vessels, such as administrating, voyage and so on, may be neglected, because they would not contribute to, neither affect, the comparison of the two alternatives. The equation is:

$$C_{tm} = \frac{OC_{tm} + VC_{tm} + CHC_{tm} + K_{tm}}{DWT_{tm}} \qquad (18)$$ [13]

where:

$OC$ : Operating Cost

$VC$ : Voyage Cost

$CHC$ : Cost of Handling Cargo

$K$ : Capital Cost

$tm$ : stands for *per-tone-per-month*

## 4. ADVANTAGES & DISADVANTAGES

None of the presented methods may characterized ideal in calculating every investing project. The NPV and IRR methods lead to more or less the same decision, as for the acceptance or rejection of a project. The significant difference between these two methods arises when two projects are mutually rejected and the investor must accept one of them; it is then very possible the two methods to lead to different decisions. The handicap of the IRR method is that the alternative investments may yield different rates of return, r, which is not necessarily the yield expected from reinvesting the cash inflows of the projects. On the contrary, the NPV method, allows the evaluation of all alternatives with the same discounted rate $i$. In cases these two evaluation methods lead to different decisions, the investor should select the project accepted by the NPV method. [14]

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[13] Downard M. John, *Ships-Costs, Running Costs*, London: Fairplay Publications, 1981, p. 244

[14] Tzoannos J., *Financial Management* , Sbilias publications, Athens 1998, p.123-125

Usually the NPV method and the Cost/Benefit method lead to similar results. It is though possible to have different results when the investor has to compare more than two projects. The major difference of these methods is that the NPV evaluates the projects according to their return, while the C/B evaluates the alternatives according to their rate of return.

Incremental analysis is a comparative method, which might be applied after the NPV evaluation of the alternative investments. Short run investments as well as long run are evaluated by different formulas. The investor's decision will be based upon his economic criterion, which could be either to maximize the return or to maximize the rate of return. It is very much possible that one alternative may yield a higher return while the other yields a higher rate of return. The "Cost per ton of cargo" method may be applied for short-term investment and for a specific type of cargo. It might be helpful for voyage charter venture or a contract of consecutive voyage charters.

## 5. CONCLUSION

The methods presented in this paper are applicable and have been resembled to the business' environment and circumstances of the shipping industry. Every investor should evaluate the options, the environment and the alternatives that he may be dealing with, before reaching the final decision. Based on the theory of replacement, a shipowner will be able to calculate all economic and business' factors that may influence him to the final decision.

Generally speaking, the accounts of an enterprise constitute the source of information, which has the greatest potential value in making estimates for economy studies. There are a number of important differences between the point of view of accounting and that, which should be taken in an economy study. Accounting involves a recording of past receipts and expenditures. Engineering economy, on the other hand, always involves alternatives. It is concerned with differences between costs rather than apportionments of costs. It does involve consideration of the time value of money. The methods and theories of replacement may be applied not only in any type of vessel, but also in any type of investment.

The commercial banks' viewpoint is to secure the interest and the principal repayment and thus they focus on the quality and the likelihood of the cash flows that are the primary source of paying off the loan. The past relationship between the investor and the financial institution, the loan's characteristics and the considerations that affect them, will be evaluated before deciding the terms of financing. The banks are also concerned with factors such as the type of the vessel and its past record of value in the market and the protection they have in the event of default. Despite all the necessary calculations and evaluating methods, the economic strength and the past lending records of the customer will determine to a great extent the approval of the loan, and therefore the materialization of the project.

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