International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2017, 7(5), 59-70.

An Islamic Wealth Management Investment Appraisal of Oil Tankers

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ABSTRACT

The purpose of this research is to develop an Islamic wealth management investment appraisal of the performance of tankers as a primary segment within international shipping and an important component of the oil and energy markets. Shipping is a strong growth industry with about 84% of global trade carried by the international shipping industry. The problem is that many Islamic wealth management institutions and investors have minimal exposure to investment in international shipping. However, shipping is a highly capital intensive industry and currently 75% of ship lending has been conducted by European banks and financed on a conventional basis. Post financial crisis, ship owners, ship lenders and shipyards have all been exposed to the impact of over-levered balance sheets and debt finance. Our objectives are to evaluate the risks and returns of shipping under the framework of Islamic equity finance, and to analyze the performance of investing in tankers over the long term, in order to appeal to private and institutional clients. Accordingly, our methodology adopts an investment analysis of a full population of historical data over a period of 20 years, to evaluate performance involving a maritime return on investment, internal rate of return, net yield and standard deviation measures of risk and return. Our findings reveal that whilst earnings are volatile in comparison to capital market financial products, unlevered, tax-free returns on tanker investments out-perform financial and other real assets. The significance is that Islamic equity finance, rather than debt at the time-value-of-money, should enhance investment in the tanker sector.

Keywords: Islamic Finance, Islamic Investment, International Shipping
JEL Classifications: G11, G23, G24, G31, G32, R40

1. INTRODUCTION

Seaborne trade is fundamental to globalization: 84% of global trade, representing 11,128 million tonnes, is carried by international shipping totaling 1.75 Bn DWT, 87% of which, is carried by the primary shipping segments involving are bulkers (43%), tankers (31%) and containerships (13%): However, 75% of ship-finance is financed on a conventional basis and Malaysian Islamic Financial Institutions (IFIs) and investors have essentially no exposure to international ship-financing (Abdullah et al., 2016). Muslim investors currently have USD 9.5 trillion in assets that are intermediated by conventional institutions, with estimated potential annual revenue of USD 180 billion in fund management fees alone (SCM, 2017. p. 19), attributable to a lack of suitable Islamic investment instruments and services on offer by IFIs. Therefore, these investors represent an opportunity to develop investment rather than credit-based intermediation, involving an attractive *Shari'ah* compliant equity product. In order to determine the willingness and ability to finance maritime assets, investors must understand the associated risks and rewards with regard to international shipping. We adopt an investment analysis of a full population of historical data over a period of 20 years to evaluate maritime performance by adopting internal rate of return (IRR), net yield and standard deviation measures of risk and return. In terms of the literature (Section 2), we considered the underlying theories related to risk and returns for investments. We assessed inter-temporal choice for investments and the marginal efficiency of capital (MEC) in evaluating returns. We also reviewed the pre-requisite of market risk for income to be considered lawful in Islam, as reflected in the Islamic normative theory of profit. We then identify a suitable investment framework and methodology (Section 3) for Islamic private equity investors to evaluate the investment performance of international shipping. We then present our findings and discussions in terms of oil tanker performance involving investment analysis (Section 4) over 20 years in terms of unlevered IRRs and net unlevered income yields for bulk-carriers as one of the primary shipping segments, along with the evaluation of risks and returns including correlation matrices for selected classes of vessel. Finally, we provide some concluding remarks and recommendations (Section 5).

2. LITERATURE REVIEW

2.1. Inter-temporal Choice for Investments and the MEC

In considering investment decisions for maritime assets, Fisher stated that, time preference (impatience) is a derivative of an individual's "marginal want for present and his marginal want for future income" (Fisher, 1930. p. 97). An individual makes investment and savings decisions in a firm or as a consumer. With the consumer, an inter-temporal budget constraint indicates present and future income (m_0, m_1) and by making a decision on present and future consumption (c_0, c_1) also makes a present savings decision ($s_0 = m_0 - c_0$) yielding future savings ($m_0 - c_0$) ($1 + r$), given a know market rate of interest (r). The absolute value of the budget constraint is ($1 + r$) corresponding to the increase in future consumption from present savings.

Preferences indicated by an inter-temporal utility function $u(c_0, c_1)$ are presented in the form of indifference curves. The absolute value of the slope of these indifference curves yields the individual's inter-temporal marginal rate of substitution (MRS), which measures the value of present consumption in terms of future consumption and reveals a decreasing MRS: As individuals increase present consumption, its value in terms of future consumption decreases. The MRS is the ratio of the marginal utility of present consumption to the marginal utility of future consumption and at optimal consumption (with the indifference curve tangent to the budget constraint line) the consumer's MRS equals one plus the interest rate (MRS = $1 + r$). Therefore, at optimal consumption an individual values present and future consumption at its opportunity cost.

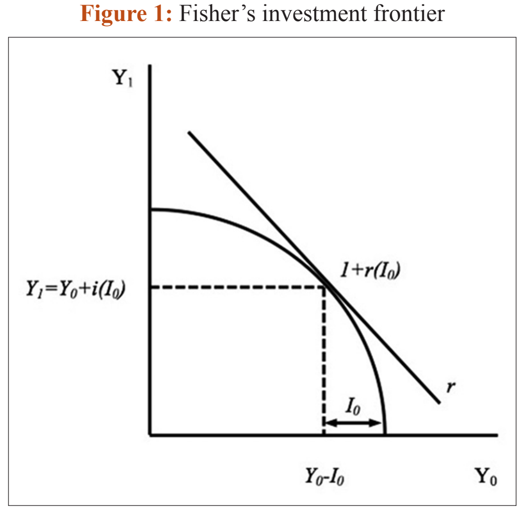
In terms of optimal savings and investment decisions, the objective for the individual is to maximize utility subject to a budget constraint. Fisher's separation between a firm and consumer reflects that all individuals, irrespective of their preference for present or future consumption, select the same investment plan, which maximizes the PV of total income and is equivalent to maximizing the net present value (NPV) of the investment (Fisher, 1930; MacMinn, 2005. p. 2-9). The Fisher model has been the foundation of corporate finance (Abdullah et al., 2017): In terms of investment analysis we discount future net cash flows involving the TVM. For Fisher, the optimal decision for the firm's investment decision is where the marginal rate of return over cost equals the interest rate. We may realize that Fisher's rate of marginal return over cost is equivalent to Keynes' MEC. Keynes defined the MEC, which is otherwise known as the IRR, as "that rate of discount which would make the present value of the series of annuities given by the returns expected from the capital-asset during its life just equal to its supply price" (Keynes, 1936. p. 135). It is the rate of discount, that makes the discounted present value of an expected income stream equal to the cost of capital, such that, the MEC (IRR) makes the NPV equal to zero. Fisher's investment frontier is concave (Figure 1), which reflects the diminishing marginal returns to investment.

The investment decision will be optimal where the investment frontier is tangent to the interest rate (capital market) line, which is given by the combination $Y_0 - I_0$, $Y_0 + i(I_0)$, where i is the yield on investment, r is the market interest rate, such that the condition $i(I_0) = r$ holds. An entrepreneur will continue to invest until the marginal return over cost equals the interest rate, which is the absolute value of capital market line = $1 + r$. Fisher thus laid the foundations for the capital asset pricing model (CAPM), where the value of as asset (a vessel) is independent of its capital structure, "the market value of any firm is independent of its capital structure and…the average cost of capital, to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class" (Modigliani and Miller, 1958. p. 268-269). Whether through the discount rate, or with the IRR, in reality the cost of capital equals the unlevered cost of equity, in the form of an annual compound rate, which can be benchmarked to other assets priced along the yield curve and hence serves as a investment framework for our analysis.

2.2. Islamic Normative Theory of Profit

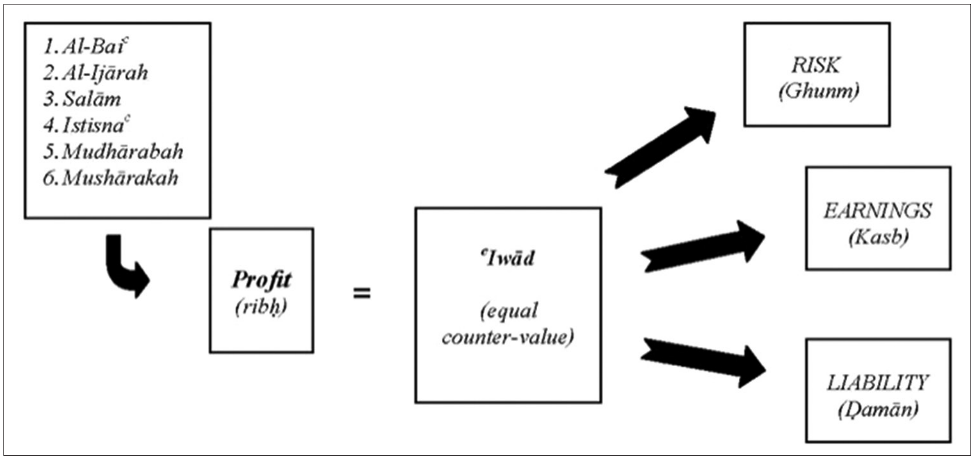
In terms of income earned from international shipping, market risk is a pre-requisite of lawful profit in Islam. In analyzing substance over form in determining a valid transaction in Islam (Abdullah et al., 2017), Ibn al-ʽArabi (1957) (d.1148) said, "Every increase which is without an equal counter-value (*'iwad*) is *riba,*" and the components of *'iwad* are; (1) risk (*ghunm*), (2) liability (*daman*), and (3) earnings (*kasb*) (Ibn al-ʽArabi, 1957, 1. p. 242; cited also by Ziaul, 1995. p. 10; Rosly et al., 1999. p. 1249; Rosly, 2005. p. 30; Rosly, 2001). As reflected in Figure 2, the necessary components of *'iwad* must be present for profit (*ribh*) to be lawful (*halal*), and if any of the components of *'iwad* are not present in a transaction then the income is unlawful (*haram*). In terms of risk (*ghunm*) it refers to market risk; earnings (*kasb*) implies to strive to earn

Figure 1: Fisher's investment frontier



Sources: Fisher (1930), MacMinn (2005)

Figure 2: The Islamic theory of profit



Source: Abdullah et al. (2017)

or gain wealth, thus implying work and effort (*amal*); whereas, liability (*daman*) includes ownership (*milkiyyah*). The *Majallah* reaffirms this with a number of important maxims: "Reward begets risk" (*al-ghurm bi al-ghunm*) (*Majallah*, no. 87), "benefit begets liability" (*al-kharaj bi al-daman*) (*Majallah*, no. 85), and "burden is proportional to benefit, and benefit is proportional to burden" (*Majallah*, no. 88).

3. METHODOLOGY

The research is essentially a quantitative empirical investigation involving investment analysis to demonstrate that the MEC confirms that equity finance and profit sharing, rather than debt finance at interest, is more efficient in allocating investible resources to develop the international shipping industry. Given the MEC, a lower interest rate will increase investment, which caused Keynes to admit that interest sets "a limit to the level of employment. ...and... holds back production" (Keynes, 1936. p. 222, 235). In order to measure our primary objectives, a full population of maritime data was sourced from Shipping Intelligence Network, an online database of time-series subscription data acquired from Clarksons Research Studies (2016), the research division of the world's largest international ship-broking company, with additional data on vessel operating costs from the Moore Stephens (2016), a leading international maritime consultant and accountant, in order to assess the economic viability of maritime investments, from the perspective of a potential investor in maritime assets.

The value of a vessel is determined from the vessel's ability to generate financial surpluses for capital providers and is a function of commercial and technical management. Financial surpluses include both income and capital appreciation. Accordingly, our research intends to adopt a financial analysis of a full population of historical data over a period of 20 years,

i. To develop a "mark-to-model" maritime return on investment (MROI) and discounted cash-flow (DCF) analysis involving the IRR
ii. To financial appraise individual segments of the international shipping market involving bulkcarriers, tankers and containerships, involving the IRR and net income yield
iii. To evaluate risks and returns of maritime assets and compare them by shipping segment and to other real and financial assets.

Commercial management or operations are functions associated with the running of a vessel by a ship-operator and includes the commercial decisions associated with the sale and purchase and chartering of vessels, the responsibility for the employment of a vessel with cargoes (whether on the basis of time-charter or voyage charter), scheduling, stemming or the ordering of bunkers (fuel), managing arrangements for loading and discharging of vessels at ports with associated port activities and the lay-up of vessels (Downard, 1994. p. ix).

Technical management or specifically ship-management refers to the functions not undertaken by the ship-operators and are associated with the responsibility for manning, supplying and insuring the vessel and ensuring that the vessel is available to the ship-operators for the maximum amount of time possible in terms of available trading days. The operating expenses or running costs involve the costs of managing the vessel and comprise all activities associated with ship-management (Downard, 1994. p. ix). It is not uncommon for the technical management to be sub-contracted to professional third-party ship-managers.

3.1. Determination of Free Cash Flow

The determination of free cash flows involves assumptions relating to the leasing of vessels involving charter revenues, operating expenses (OPEX), the market value of the sale and purchase of new and second-hand vessels and the residual scrap value of vessels at the end of their economic life.

Charter revenues involve actual time-charter rates or their voyage-charter equivalents involving spot (time-charter trips), short-period (2-4 or 4-6 months), for long-period (1, 2, 3, 5 years duration) or contracts of affreightment, reported by shipbrokers or research companies. With access to on-line subscription databases (for example, from Clarksons Research) it is possible to conduct a full population investigation of long-term historical average time-charter rates, newbuilding, second-hand and demolition price data of vessels, over a period of 20 years, in order to derive an analysis of market expectations as to the future development of income and prices. Additionally, analysis conducted regarding the current fleet in terms of volume and age profile; current and additional fleet capacity, in terms of the order book, would provide an indicator for the expected market supply of vessels. Furthermore, macro-economic and industrial data would provide analysis of the prevailing economic outlook and expected market demand, in terms of the derived demand of vessels. Ship-brokerage commissions earned on freight (1.25% up to 5%) and sale and purchase of vessels (1-2%) should be taken into account, although ship-management fees (3-5%) would typically be included in operating expenses or daily running costs (DRC). The utilization rate, involving the number of operating days a vessel is employed, must be considered with regard to normal years of ship-operation and when the vessel is dry-docked for the renewal of its classification (once every 5 years). The Hamburg Ship Evaluation Standard recommends 358 days in normal years and 343 days in class renewal years (Mayr, 2015. p. 151), which averages 355 and is adopted in this research. With individual vessel evaluations, the utilization might be affected in the short term when taking into account the age of the vessel, classification surveys and class renewal, expected off-hire periods or lay-up if market conditions are poor.

Operating expenses involve costs averaged over 365 days or DRC and typically comprise crew wages and expenses, victualing, stores, spares, lubricants, maintenance, miscellaneous costs, ship-management fees, annual insurance premiums, dry-dock expenses, annual class/registration fees, and additionally, environmental costs should be taken in account. Any forecasting for capital budgeting purposes should also incorporate the effects of inflation.

Residual value or scrap value of a vessel refers to the scrap value expected at the end of the economic life of a vessel, which is typically 20-25 years (Stopford, 2009. p. 263). The scrap value is a function of a vessel's light displacement (LDT) and the scrap price is expressed in USD per LDT. With individual transactions for demolition, brokerage commissions (of 1-2%) should be factored in.

3.2. Mark to Model

This study develops a "mark to model" MROI and a DCF method of analysis involving the IRR, to financially appraise the returns on the investment of a fleet of ships. Our precedent for the suitability of this approach is Slogett (1984) and also Mayr (2015), except we adopt historical analysis as a guide to performance, as the DCF is indeed appropriate for maritime valuation and project financing. The MROI return of economic value added (EVA) on the net asset value (NAV) of a fleet of vessels at the end of the accounting period. This is akin to Stopford's Return on Shipping Investment (ROSI), but in reality his ROSI was an annual return of EVA over the market value of a vessel or fleet of vessels (Stopford, 2009. p. 327),

$$MROI = \frac{EVA_t}{NAV_{t-1}} = \frac{EBID_t - Dep_t + Cap_t}{NAV_{t-1}} \times 100 \quad (1)$$

EVA is a function of earnings before interest and depreciation (EBID), which is the free cash flow generated from the daily time-charter income less operating expenses (OPEX), deducting the depreciation (DEP) and adding the change in market value of maritime assets reflected in any capital gain (CAP), over 1 year. Normally, depreciation is a non-cash item, but our model will deal with replacement out of cash flow, involving a fleet comprising the same number of ships and age profile over the period of analysis in order to reflect a true reflection of economic depreciation. Also, replacement is not necessarily a fixed cost and in reality can be varied to accommodate market conditions and cash-flow: When operating cash flow fall, replacement can be deferred an older ships can continue trading, whereas if cash flow increases more ships can be acquired. Strategic decision-making through investment analysis provides flexibility and financial security to the shipowner. Another advantage of evaluating the EVA, in the context of private equity, is that it we can determine the investment multiple, which is the multiple of invested capital (MOIC) or total value to paid in capital.

To value a vessel based on DCFs, the expected future free cash flows must be discounted to a present value using an appropriate discount rate, which represents the required rate of return. The weighted average cost of capital (WACC) for maritime assets should represent the required rate of return on an alternative investment, which is equivalent to the investment in terms of timing, risk, currency and taxation cash-flows. Where vessels are denominated in USD, the discount rate should reflect US capital market data. The valuation of maritime assets is based on free cash flows available for distribution to the capital providers, whether debt or equity. It is not necessary to take into account the benefit attributable to interest as a deductible expense for tax purposes, since the shipping industry is essentially tax-free. This is due to the fact that governments have either introduced tonnage tax regimes, as in the case of the UK for example, or stipulate that income deemed earned from shipping companies is tax exempt, as in the case of Malaysia. A tonnage tax is not a tax, but rather a method for determining taxable income, and thus taxation is independent of earned profits: Shipping companies are charged corporation tax on a fixed notional profit, calculated by reference to the net tonnage of its ships, instead of the actual profits earned from its shipping activities. The taxable income as calculated by this method is considerably lower than the actual profit. Tonnage tax regimes also allow flexibility for the operation of foreign flag vessels although this flexibility can be built into wider tax exemption on shipping income as reflected in Singapore's Approved International Shipping Incentive ("AIS"), which is a tax incentive available to resident companies which own or operate foreign flagged ships. In summary, the tax-deductible benefits associated with debt finance at interest are negated in international shipping, when income earned from shipping is tax exempt for on-shore or off-shore companies. Thus, the WACC may be expressed as follows,

$$WACC = re \cdot \frac{E}{V} + r_d \cdot \frac{D}{V} \quad (2)$$

Where, $V = E + D$

Such that, r_e = The cost of equity, r_d = The cost of debt, E = The market value of equity and D = The market value of debt. However, in a perfectly efficient market, according to the CAPM, the value of a vessel is independent of its capital structure (Sharpe, 1964; Modigliani and Miller, 1958; 1964). “The market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate ρ_k appropriate to its class” (Modigliani and Miller, 1958. p. 268), where S denotes the market value of equity and D the market value of debt, $\bar{X}$ is the expected return on the assets owned by a company and V denotes the value of a firm.

$$\frac{\bar{X}}{(S_j + D_j)} \equiv \frac{\bar{X}}{V_j} = \rho_k \text{ for any firm } j \text{ in class } k \quad (3)$$

Or equivalently, “the average cost of capital, to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class (Modigliani and Miller, 1958. p. 268-269).

$$\frac{\bar{X}}{(Sj + Dj)} \equiv \frac{\bar{X}}{V_j} = \rho_k \text{ for any firm } j \text{ in class } k \quad (4)$$

Thus, the discount rate would reflect the cost of capital and rather than a WACC, with the discount rate equals the unlevered cost of equity (r_e). By adopting an annually compounded rate, the discount factor, present value factor, WACC and r_e are all equivalent and can be benchmarked to other assets priced along the yield curve. Since, the EVA reflects the future value of annual cash-flows (FV), then a present value (PV) or DCF can be derived from $PV = FV/(1+r)^t$ in order to generate a NPV. Specifically, the NPV is the PV of an investment’s expected net cash-flows, less the cost of the initial investment, and the formula for the discounted sum of all cash-flows is,

$$NPV = -C_0 + \sum_{t=1}^{T} \frac{C_t}{(1+r)^{1/t}} \quad (5)$$

Where, C_0 is the present value of the initial capital invested, C_t is the net cash-flow during the period t, r is the discount rate and T is the number of time periods (years). Then the IRR is the discount rate (r), which causes the discounted NPV of a series of future cash flows produced from an investment to equal 0,

$$\sum_{t=0}^{T} \frac{C_t}{(1+r)^t} = 0 \quad (6)$$

Hence, MROI, IRR and NPV can be employed in developing a “mark to model” framework for maritime investments, where the maritime investor can modify the DCF analysis to incorporate the actual market price of a vessel (MP) and net time-charter earnings (TCE) less operating expenses (OPEX) in the form of DRC together with any residual value (RV) through a trade sale or demolition when a vessel is scrapped.

$$NPV = -MP_0 + \sum_{t=1}^{T} \frac{TCE_t - DRC_t}{(1+IRR)^{1/t}} + \frac{RV}{(1+IRR)^{1/t}} = 0 \quad (7)$$

$$\sum_{t=1}^{T} \frac{TCE_t - DRC_t}{(1+IRR)^{1/t}} + \frac{RV_t}{(1+IRR)^{1/t}} = MP_0 \quad (8)$$

We can then compare the risk-equivalent required rate of return of different investments through the IRR and also a profitability index (PI) involving their NPV of inflows and outflows,

$$\text{PI} = \frac{\text{NPV of cash inflows}}{\text{NPV of cash outflows}} \quad (9)$$

3.3. IRR and Net Income Yield

A rolling 20-year unlevered IRR (r) can be calculated for three shipping segments (bulkcarriers, tankers and containerships) for 5-year-old assets, where the IRR (r),

$$r = (FV/PV)^{(1/t)} - 1 \quad (10)$$

Additionally, an unlevered net income yield by shipping segment, and in aggregate, over 20 years, can be calculated. The net income yield (%) = Annual income/Investment, where annual income = (time-charter rate × 355 operating days) less operating expenses (DRCs × 365 days) and the investment reflects the actual market price of the vessel.

$$\text{Net income yield } (\%) = \frac{\text{Annual income (USD)}}{\text{Investment (USD)}} \quad (11)$$

3.4. Risk and Returns

We may evaluate the risks and returns of maritime investments, by adopting the CAPM, which equates volatility with risk. As a measure of volatility of shipping earnings, the population standard deviation (σ) is applied to quantify the amount of variability or dispersion around a mean and is expressed in the same units as the original data, which in this case, is derived from a set of net time-charter rates from each type of vessel selected from each primary shipping segment, over the period of analysis. The larger the variability or dispersion is, the higher the standard deviation and vice versa.

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad (12)$$

Rates of return are measured by the net income yield (11) on individual vessel types and by market segment and then compared to other real and financial assets.

We can also compare various types of vessel through a correlation of net time-charter earnings in order to evaluate various investment strategies by analyzing their relationships, as some relationships are expected to be positive, whilst others negative. Ship-owners are able to reduce the volatility of earnings by incorporating vessels with low or negative correlations in their fleet. On the other hand, investors may be unwilling to reduce volatility risk as this will merely result in lower returns on their maritime assets. The Pearson product-moment correlation coefficient (ρ) for a population is adopted to measure the strength of the linear dependence (correlation) between two variables, reflected in two sets of net time-charter earnings over the period of analysis. The population correlation coefficient is defined in (13), where σ_x and σ_y are the population standard deviations, and σ_{xy} is the population covariance.

$$\rho_{xy} = \frac{\sigma_{xy}}{\sigma_x \sigma_y} \quad (13)$$

Thus, our methodology has clarified the nature of ship-operations and ship-management and clarified the nature of a stream of income and expenses associated with shipping companies. Investment analysis is undertaken using a full population of maritime price and earnings data over a period of 20 years from 1995 to 2015. Furthermore, the MROI, IRR and risk-reward analysis facilitates the development of a business strategy for maritime investment and demonstrates that if we define risk as the possibility of losing an investment, then in terms of the CAPM, despite the risk associated with volatile earnings, the returns over the long term reveal that international shipping is not nearly as risky as the volatility suggests. Such an analysis would form part of any due diligence conducted by retail, high net worth or institutional investors in the role of a limited partner as capital provider within an Islamic private-equity shipping fund.

Additionally, meetings were conducted with various stakeholders, including institutional investors, Islamic banks and regulators, to obtain views and comments from practitioners, thereby enhancing the research. From a Malaysian perspective, these would include (but not limited to) Bank Negara (MIFC), Maybank Islamic, CIMB Islamic, Bank Tokyo Mitsubishi (BTMU), Employees Provident Fund (EPF) and EPF Islamic, the Government Pension Fund (KWAP), the Malaysian Hajj Fund (LTH) and the Investment Account Platform (IAP) owned and operated by IFIs.

4. FINDINGS AND DISCUSSIONS

In terms of historical analysis and also in forecasting charter rates for maritime investment valuation in terms of an income mark-to-model approach, an analysis of current and expected market conditions are crucial. The price of a vessel is a function of two ratios, the demand over supply of the vessel as the numerator, over the demand over supply of money as the denominator, since money is the denominator of all economic transactions. The impact of US monetary policy on maritime investments is very much under-estimated. Figure 3 summarizes the deadweight capacity of the tanker fleet (Mn DWT), the volume of new vessels on order at shipyards (order-book), the volume of scrapping of vessels (demolition) and the volume of deliveries of new ships entering the market (deliveries). Actual annual tanker fleet development therefore is primarily a function of the existing fleet, less demolition and adding deliveries. Given that ordered vessels will be delivered over a period of 2-3 years, it can be taken as an indicator for expected future market supply, so that the ratio of the order-book, less expected demolition (of vessels over 20 years of age), to the existing fleet, can be taken as an indicator for expected fleet growth. Projected fleet development, as a measure of market supply of tankers, can be compared with projections of the world seaborne crude trade, as a measure of market demand for tankers. At the time of the global financial crisis in 2008, projected fleet growth was 36.2% for the 3 years from 2008 to 2010, whilst the projected seaborne crude trade was −2.0%, thus projected market supply growth significantly exceeded expected market demand growth and we can anticipate over-capacity of vessels, which did result in a significant decline in tanker prices and charter rates. In 2015, the projected fleet growth is 18.4% for 2015-2017, whilst projected seaborne crude is 7.1%. Hence the gap between supply and demand has narrowed considerably, although differing tanker classes may under-perform others. The decline in oil prices since 2015 has seen an increased in supply of crude, which has benefitted very large crude carrier (VLCCs) with time-charter earnings doubling in 2015 as compared to 2014 and rates increased further in 2016.

However, over the long term, nominal prices of VLCC tankers expressed in USD (Figure 4), are significantly affected by US monetary policy, which is apparent when expressing prices in terms of gold. Thus the supply and demand of money should be taken into account as much as, if not more so, that the supply and demand of tankers.

In terms of providing clarity to potential investors as to the attractiveness of investing in different classes of vessel within the tanker segment, our analysis must effectively communicate both risk and reward. We can apply the unlevered net income yield for individual classes of vessel as a measure of return. Typically, within the framework of the CAPM, investment analysis equates volatility with risk. By comparing the average net time-charter earnings of different classes of vessel using the standard deviation as a percentage of mean earnings we can measure risk. In terms of constructing a shipping efficient frontier for the different classes of vessel (Table 1 and Figure 5), our analysis reveals that the

Figure 3: Tanker fleet development

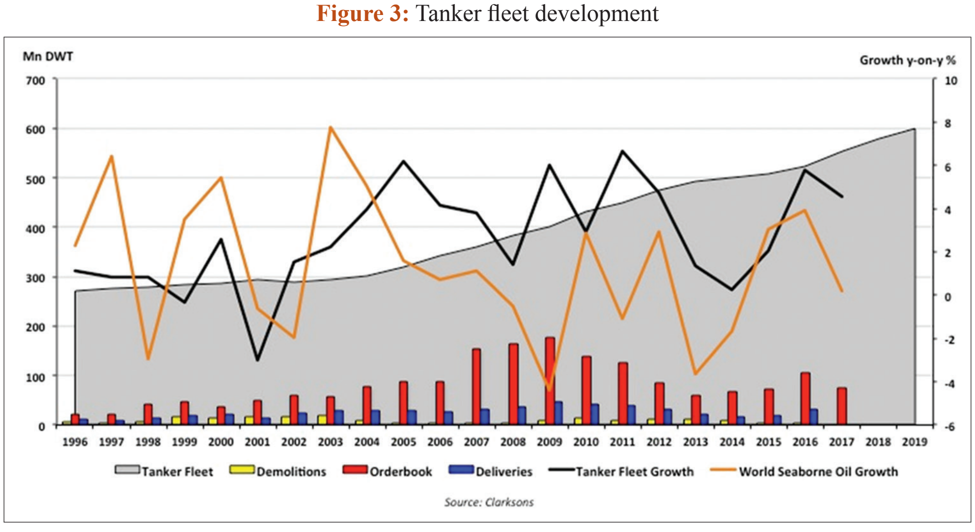


Figure 4: Nominal and real very large crude carrier secondhand prices (1976-2015)

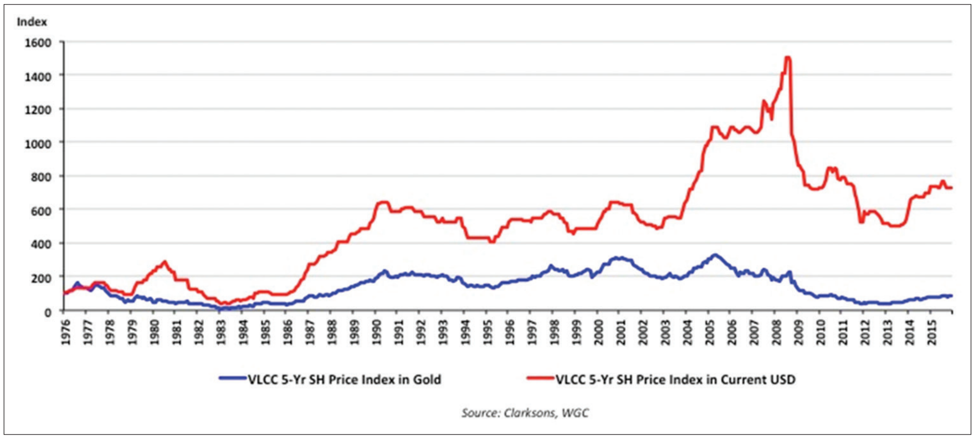
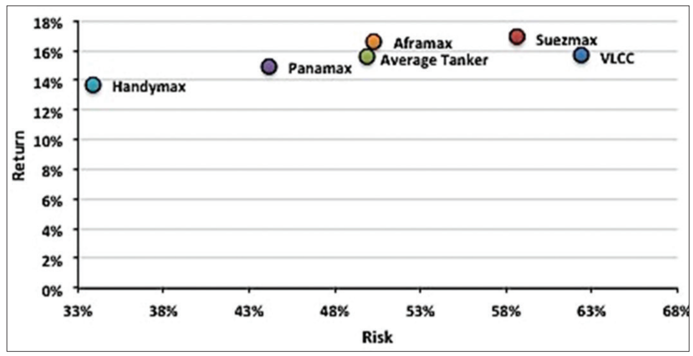


Table 1: Tanker risk and return (1996-2015)

Vessel class	Risk (%)	Return (%)
VLCC	62	16
Suezmax	59	17
Aframax	50	17
Panamax	44	15
Handymax	34	14
Average tanker	50	16

VLCC: Very large crude carrier

Figure 5: Tanker efficient frontier (1996-2015)



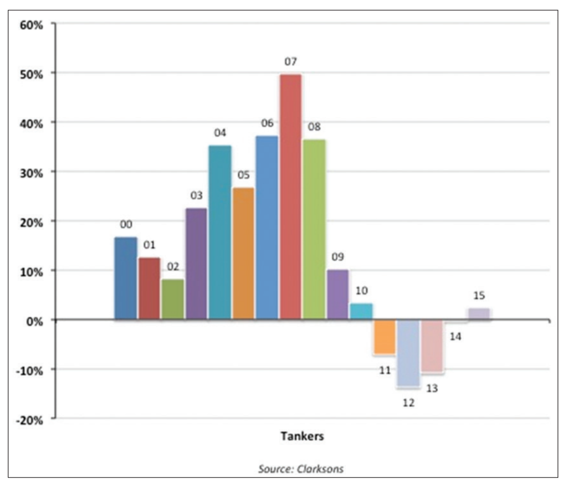
yields are strong, averaging 16%. If the average earnings are the revenue stream needed to operate a shipping business to generate a "normal profit" and we define a "normal profit" as whatever the participants in the market settle for (Stopford, 2009. p. 324), then between 1996 and 2015, tanker shipping companies would earn 50% more or less than is required, reflecting associated risk.

For a typical stock market firm and in terms of the capital market, such volatility would be considered high risk. However, our 20-year unlevered IRR and net income yield data reveals that tanker returns are very healthy over the long term (Figures 6 and 7). So if we define risk as the risk of losing an investor's investment capital, then the answer must be that tanker shipping is low risk only if equity capital is adopted since debt financing is likely to threaten mispriced maritime investments in the presence of volatile earnings.

With global equities recently generating a 2.5% dividend yield and global fixed income a yield of 1.8% (Morgan, 2015), capital markets are no longer providing the returns necessary for global investors. With global equities recently generating a 2.5% dividend yield and global fixed income a yield of 1.8% (Morgan, 2015), capital markets are no longer providing the returns necessary for global investors. Given that the VLCC is the most important segment of the tanker fleet, we have developed a MROI model as alternative to other assets.

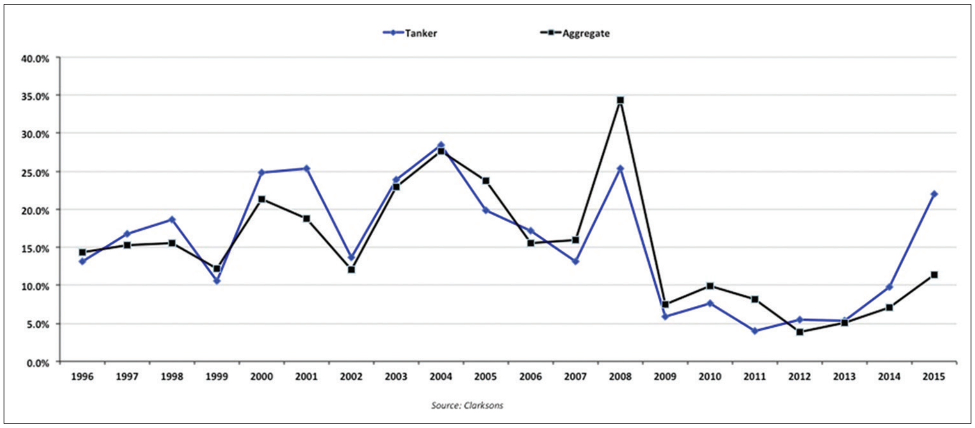
Classical economists understood that a 'normal profit' is whatever the market participants are prepared to settle for, and shipping companies typically reflect perfect competition, where barriers to competition hardly exist (Stopford, 2009. p. 324). "The unit of the private property economy was the firm of medium size. Its typical legal form was the private partnership. Barring the

Figure 6: Tanker 20 year rolling 5-year unlevered internal rate of return



"sleeping partner," it was typically managed by the owner or owners, a fact that it is important to keep in mind in any effort to understand "classical' economics" (Schumpeter, 1994. p. 545). This description not only mirrors the private equity structure, but also fits the description of many Asian or European shipping companies operating in the bulk or tanker trades. Furthermore, ship-ownership and management is akin to asset management where investors accept market risk and reward in search of income and capital appreciation. The shipping company's risk is therefore determined by its business strategy and not just merely the shipping cycle itself.

Figure 7: Tanker and aggregate shipping unlevered annual net income yields (1996-2015)



In developing an international shipping investment model, we can consider a hypothetical shipping company trading VLCC tankers over 20 years between 1996 and 2015. EBID is a function of the average time-charter equivalent (TCE) earnings for a 10-year-old VLCC tanker over 355 operating days, less vessel operating costs (OPEX) or DRC over 365 days. The age and size of fleet is maintained throughout in order to reflect economic depreciation. The fleet consists of 20 vessels aged 1-20 years old so that the average age of the fleet is 10-year-old. Whilst depreciation is not a fixed cost since it is treated as a non-cash item, replacement is dealt with annually out of cash flow, with a newbuilding purchased for cash at current market prices and the oldest sold for scrap at the prevailing demolition price.

Depreciation is therefore defined as the cash replacement cost of one vessel. This also allows the flexibility for deferment of depreciation, if market conditions tighten where operating income does not cover replacement and the company can delay an acquisition in favour of an older vessel trading on for a period of time until the market recovers.

Capital gain is a function of the change in the average market price of a 10-year-old VLCC tanker, to determine the fleet value year-over-year. This will not reflect true appreciation as the replacement cost of the fleet has also increased, and the company has the same maritime assets it began with. Changes in EVA equals EBID, depreciation and capital gain for the current year, which determines the change in NAV for that year. The MROI is the percentage return of annual EVA in the current period over the NAV in the previous period. The average MROI over 20 years is an unlevered net return on investment that captures both income and capital appreciation.

Thus, our VLCC tanker shipping company (Table 2) earned USD 5,129.1 Mn in EBID over 20 years. It spent USD 819.2 Mn cash in fleet replacement, leaving USD 4309.9 Mn in free cash-flow. The fleet increased in value from USD 840 Mn to USD 2,200 Mn in 2007 just prior the global financial crisis and subsequently reduced to USD 1100 Mn by 2015, reflecting an increase in capital of USD 260 Mn over the 20-year period. Hence, the total EVA was USD 4570 Mn (= 5129.1 − 819.2 + 260), such that the NAV increased from USD 840 Mn to USD 5410 Mn.

Although the standard deviation of TCE earnings was 62% suggesting a risky investment from the perspective of capital market financial assets, the unlevered net MROI of 10.7% and the unlevered IRR of 27.47% (Tables 2 and 3), confirms a not so risky debt-free and tax-free investment.

At the time of the global financial crisis in 2008, projected fleet growth was 59.2% for the 3 years from 2008 to 2010, whilst projected seaborne crude was −2.0%, thus our ship-owner would likely have anticipated market over supply in relation to demand, selling assets and deferring new acquisitions to maximize capital gain, but even still, the model was internally financed from equity and EBID was positive throughout.

The IRR of 27.47% returns the NPV to zero (Table 3), whilst with a required rate of return (r) of 10%, the NPV is USD 2.0928 Bn. In terms of investment or disinvestment decision−making, opportunities can be identified for vessel trade sales, by a comparison of market prices (MP) and NPV and also the IRR in relation to the risk-equivalent required rate of return (r). Vessel prices lower than the NPV (where the NPV >0) represent a buying opportunity for an investor, whilst market prices higher than the NPV represent a selling opportunity for a ship-owner. Equally, mispriced vessels can be determined by equating the IRR to the required rate of return (r). If the expected IRR of a vessel is higher than the required rate of return (r) then the MP of vessels is cheap and investors should buy, whilst if the IRR is below the required rate of return (r), the MP of vessels are expensive and would therefore represent selling opportunity for the ship-owner (Table 4).

A PI can also facilitate an investment decision. Assuming the PV of expected future cash flows, discounted at 10% are USD 2,092.8 Bn (from Table 3) and the initial capital invested was USD 840 Mn, then the PI is 2.49 (Table 5). A NPV clearly depends on the size of the initial investment, thus the PI can also facilitate investment opportunities by ranking. The VLCC tanker PI can broadly be compared to other maritime segments, other vessel classes within the tanker segment, or can be applied to different types of vessels within the same vessel class (i.e. between individual VLCCs).

In any case, from our data we can identify the opening NAV, EVA and closing NAV (Table 2) and determine the investment multiple

Table 2: VLCC tanker MROI analysis (1995-2015)

Year	EBID				Dep					Cap.			EVA ($ Mn)	NAV ($ Mn)	MROI (%)
					Cash replacement cost of one vessel					Capital gain					
	Number of vessels in fleet	TCE $/day	Less DRC $/day	EBID ($ Mn)	NB price ($ Mn)	LDT	Scrap price/ldt	Demolition price ($ Mn)	Replacement cost ($ Mn)	10-year-old market price ($ Mn)	Fleet value ($ Mn)	Capital gain/ (loss) ($ Mn)			
t	F	TCE	OPEX	EBID	NP	LDT	SP	DP=LDT.SP	DP−NP	MP	F.MP	Cap	EBID+Dep+Cap		
1995	20	22,562								42.0	840.0			840.0	
1996	20	27,270	5124	156.2	39.0	40,700	155	6.3	−32.7	45.0	900.0	60.0	183.5	1023.5	21.8
1997	20	38,335	5283	233.6	40.5	40,700	150	6.1	−34.4	50.0	1000.0	100.0	299.2	1322.7	29.2
1998	20	35,659	5446	213.4	33.0	40,700	114	4.6	−28.4	39.0	780.0	−220.0	−35.0	1287.8	−2.6
1999	20	21,096	5615	108.8	35.0	40,700	131	5.3	−29.7	41.0	820.0	40.0	119.1	1406.9	9.2
2000	20	55,440	5788	351.4	40.5	40,700	176	7.1	−33.4	55.0	1100.0	280.0	598.0	2004.9	42.5
2001	20	38,829	6136	230.9	36.0	40,700	126	5.1	−30.9	45.0	900.0	−200.0	0.0	2004.9	0.0
2002	20	23,293	6309	119.3	36.3	40,700	169	6.9	−29.4	40.0	800.0	−100.0	−10.1	1994.9	−0.5
2003	20	52,453	6541	324.7	48.0	40,700	288	11.7	−36.3	55.0	1100.0	300.0	588.4	2583.2	29.5
2004	20	98,323	7235	645.3	64.0	40,700	363	14.8	−49.2	85.0	1700.0	600.0	1196.0	3779.3	46.3
2005	20	62,558	7640	388.4	59.0	40,700	290	11.8	−47.2	90.0	1800.0	100.0	441.2	4220.5	11.7
2006	20	64,914	8335	400.0	68.0	40,700	328	13.3	−54.7	96.0	1920.0	120.0	465.4	4685.8	11.0
2007	20	58,795	9261	349.8	97.0	40,700	380	15.5	−81.5	110.0	2200.0	280.0	548.3	5234.1	11.7
2008	20	97,152	10,650	612.0	88.0	40,700	253	10.3	−77.7	74.0	1480.0	−720.0	−185.7	5048.4	−3.5
2009	20	28,434	10,361	126.2	56.0	40,700	330	13.4	−42.6	59.0	1180.0	−300.0	−216.3	4832.1	−4.3
2010	20	33,797	10,477	163.5	57.0	40,700	490	19.9	−37.1	60.0	1200.0	20.0	146.4	4978.5	3.0
2011	20	18,263	10,650	51.9	48.5	40,700	458	18.6	−29.9	36.0	720.0	−480.0	−458.0	4520.6	−9.2
2012	20	21,187	10,361	74.8	46.0	40,700	398	16.2	−29.8	37.0	740.0	20.0	65.0	4585.5	1.4
2013	20	18,621	10,477	55.7	53.5	40,700	398	16.2	−37.3	41.0	820.0	80.0	98.4	4684.0	2.1
2014	20	30,015	10,361	137.5	54.0	40,700	345	14.0	−40.0	52.0	1040.0	220.0	317.5	5001.5	6.8
2015	20	64,846	10,247	385.6	46.0	40,700	218	8.9	−37.1	55.0	1100.0	60.0	408.5	5409.9	8.2
$ Mn		6313.9	1184.8	5129.1	1045.3			226.1	−819.2			260	4570		10.7%

LDT: Light displacement, EVA: Economic value added, NAV: Net asset value, MROI: Maritime return on investment, EBID: Earnings before interest and depreciation, TCE: Time-charter earnings, DRC: Daily running costs, VLCC: Very large crude carrier

Table 3: VLCC tanker IRR and NPV analysis (1995-2015)

Year	NCF ($ Mn)	*r*	PVF	PV	FV ($ Mn)	*r*	PVF	PV
1995	−840.0		1	−840.0				
1996	183.5	0.2747	0.7845	144.0	183.5	0.1000	0.9091	166.8
1997	299.2	0.2747	0.6154	184.1	299.2	0.1000	0.8264	247.3
1998	−35.0	0.2747	0.4828	−16.9	−35.0	0.1000	0.7513	−26.3
1999	119.1	0.2747	0.3787	45.1	119.1	0.1000	0.6830	81.4
2000	598.0	0.2747	0.2971	177.7	598.0	0.1000	0.6209	371.3
2001	0.0	0.2747	0.2331	0.0	0.0	0.1000	0.5645	0.0
2002	−10.1	0.2747	0.1828	−1.8	−10.1	0.1000	0.5132	−5.2
2003	588.4	0.2747	0.1434	84.4	588.4	0.1000	0.4665	274.5
2004	1196.0	0.2747	0.1125	134.6	1,196.0	0.1000	0.4241	507.2
2005	441.2	0.2747	0.0883	38.9	441.2	0.1000	0.3855	170.1
2006	465.4	0.2747	0.0692	32.2	465.4	0.1000	0.3505	163.1
2007	548.3	0.2747	0.0543	29.8	548.3	0.1000	0.3186	174.7
2008	−185.7	0.2747	0.0426	−7.9	−185.7	0.1000	0.2897	−53.8
2009	−216.3	0.2747	0.0334	−7.2	−216.3	0.1000	0.2633	−57.0
2010	146.4	0.2747	0.0262	3.8	146.4	0.1000	0.2394	35.1
2011	−458.0	0.2747	0.0206	−9.4	−458.0	0.1000	0.2176	−99.7
2012	65.0	0.2747	0.0161	1.0	65.0	0.1000	0.1978	12.9
2013	98.4	0.2747	0.0127	1.2	98.4	0.1000	0.1799	17.7
2014	317.5	0.2747	0.0099	3.2	317.5	0.1000	0.1635	51.9
2015	408.5	0.2747	0.0078	3.2	408.5	0.1000	0.1486	60.7
IRR	27.47%		NPV	0	4569.9			2092.8

VLCC: Very large crude carrier, IRR: Internal rate of return, NPV: Net present value

(Table 6) or the multiple on invested capital (MOIC = EVA/ Opening NAV). Although the MOIC does not take into account the TVM, it nonetheless provides an important insight as to private equity fund performance for investors.

Additionally, in terms of balance sheet valuation, the DCF approach is widely accepted for accounting and reporting standards, with regard to the impairment testing of assets, to ensure that at each balance sheet date, "the vessel's carrying amount is not higher that its recoverable amount, which is defined as the higher of the vessel's fair value less costs to sell and its value in use" (Mayr, 2015. p. 161). As such, a vessel's fair value is reflected in the market price of an arm's-length transaction between willing parties, whilst the value in use is the PV of expected future cash flows and disposal at the end of its economic life.

In summary, our mark-to-model analysis involved an initial equity investment in 20 VLCC tankers over a period of 20 years from 1996 to 2015, with an average age of 10 years and internally financing fleet replacement from cash flow. The standard deviation of time-charter earnings was 62% suggesting a risky investment from the perspective of capital market financial assets. However, with an average unlevered MROI of 10.7% and an unlevered IRR of 27.5%, investing in VLCC tankers has proven to be a very profitable tax-free business, as reflected in both the PI of 2.49 and an MOIC of 5.44. Notwithstanding the volatility of earnings, the investment was surprisingly safe with assets of USD 5.4 Bn, and can be packaged through a private-equity shipping fund to retail and institutional investors.

Table 4: NPV, IRR investment/divestment decision

Analysis	Stakeholder	Decision
MP>NPV	Investor	Don't buy
	Ship-owner	Sell
MP<NPV	Investor	Buy
	Ship-owner	Don't sell
IRR<*r*	Investor	Don't buy
	Ship-owner	Sell
IRR>*r*	Investor	Buy
	Ship-owner	Don't sell

IRR: Internal rate of return, NPV: Net present value, MP: Market price

Table 5: PI and investment decision for VLCC tankers (1995-2015)

PI	PV of future incoming cash flows discounted at 10%	=	2093	2.49
	PV of outgoing cash flows (initial capital invested)		840	
PI investment decision	If>1.0 then accept the investment			
	If<1.0 then reject the investment			
	If=1.0 then depends on other criteria			

PI: Profitability index, VLCC: Very large crude carrier, PV: Present value

Table 6: MOIC for VLCC tankers (1995-2015)

Fund value	USD (Mn)	MOIC
Opening NAV	840	
EVA	4570	5.44
Closing NAV	5410	

VLCC: Very large crude carrier, EVA: Economic value added, NAV: Net asset value, MOIC: Multiple of invested capital, PI: Profitability index

5. CONCLUSION

In this research, we have analyzed the performance for Islamic retail and institutional equity investors to investment in the bulk-carrier segment of international shipping. In terms of communicating risk and reward, we then presented our

Table 7: Investment summary for VLCC tankers

Vessel type	Risk (%)	MROI (%)	IRR (%)	PI (%)	Investment multiple
VLCC	62	10.7	27.47	2.49	5.44

VLCC: Very large crude carrier, MROI: Maritime return on investment, IRR: Internal rate of return, PI: Profitability index

investment analysis over 20 years in terms of net unlevered IRRs and net unlevered income yields for the primary shipping segments, and we also evaluated risks and returns and correlation matrices for selected classes of vessel within the primary shipping segments. We also developed investment analysis for MROI, IRRs, MOIC and profitability indices, of capsize bulk-carriers within the primary shipping segments given their role in seaborne trade.

In terms of investment performance, over a period of 20 years (1996-2015), for an equal portfolio of the three asset classes, the aggregate unlevered IRR was 13%, although our analysis reveals that between 1996 and 2009 the aggregate IRR for a 5-year hold period was 23%. We also established that the aggregate net income yield for the three primary shipping segments was 18% from 1996 to 2009, but this has softened to 15% from 1996 to 2015, given the de-leveraging and decline in asset prices and earnings post-financial crisis. Nonetheless, the average yield on maritime assets has improved from 7.1% in 2014 to 11.4% in 2015 as the industry worked its way through the excess supply of tonnage in relation to market demand. Although the standard deviation of TCE earnings for the three primary shipping segments was 48% from 1996 to 2015, suggesting a risky investment from the perspective of capital market financial assets, the financial performance of specific asset classes was not as risky as their individual volatility in earnings suggests, as reflected in our income approach, or mark-to-model analysis of VLCC tanker investment involving the MROI, IRR, PI and investment multiples (Table 7). These returns are tax-free and debt-free investments.

In fact, there is an array of potential target investments including crude oil tankers, products tankers, chemical tankers, bulk-carriers, liquefied natural gas carriers, liquefied petroleum gas carriers and containerships with their respective homogeneous vessel types within each segment.

Indeed, these types of international maritime assets were exactly targeted by Morgan Asset Management's private equity Global Maritime Investment Fund (Morgan, 2010), which raised USD 780 Bn in commitments from institutional investors between 2010 and 2014, including even a USD 25 Mn from the Omaha Schools Employee's Retirement System (OSERS), Douglas County (Morgan, 2014). Omaha, Nebraska is in the middle of the United States without any maritime heritage. Presumably for OSERS it was a suitable tax-efficient long-term investment that formed part of their asset allocation mix in terms of private equity, even though GIMF was a start-up. Given exceptionally low asset prices, there is currently an enormous investment opportunity available to retail and institutional investors, with the participation of IFIs as well as pension and investment institutions, to appreciate the importance of and participate in the development of international shipping, to grow gross domestic product and employment within the maritime economy.

6. ACKNOWLEDGMENTS

This research was funded by the Ministry of Higher Education of Malaysia, through national research grant FRGS/1/2016/SS01/UIAM/02/4. Accordingly, we wish to acknowledge the support of both MOHE and IIUM's Research Management Centre in this regard.

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