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# FREIGHT DERIVATIVES TRADING AND “VALUE-AT-RISK” IN TANKER AND DRY BULK SHIPPING

By Finn Dalheim

## WHAT IS HAPPENING IN THE FREIGHT DERIVATIVES MARKETS?

Ocean freight derivatives markets are alive and growing, in spite of the closure of Enron Online and BIFFEX in 2001. A number of new participants have been coming into the market, and there is strong demand for freight derivatives traders. The main growth has been in OTC (Over-the-Counter) dry cargo swaps or FFAs (Forward Freight Agreements), but tanker swaps are catching up fast. At the end of 2001 Imarex (International Maritime Exchange ASA) launched its first tanker freight futures contracts. With solid backing from major players in the market, including ship owners and oil companies, Imarex is likely to show strong volume growth in both tanker and dry cargo futures during 2002. This will also be positive for the OTC market.

## OVER-THE-COUNTER VS EXCHANGE-TRADED FREIGHT DERIVATIVES

Generally, the existence of a central price discovery point at a regulated exchange also tends to help increase volumes in the OTC market.

One of the key problems with BIFFEX was that the BFI-based contract specification was not well adapted to the market's preferences. In addition, the coal trade had little interest in freight

futures at the time.

Enron Online had the right contracts but it was not an exchange, and one important weakness was the lack of clearing. The defaults of companies like Andre, Kingston Marine and Enron have shown that credit risk can be significant in OTC freight derivatives.

Today's OTC FFA and swap markets seem to have the right contract specifications, but lack clearing and the benefits of a central price

discovery point. Clearing not only removes counter party credit risk and lowers transaction costs, but also overcomes the risk in the OTC market that competitors can get extensive information about a company's derivatives positions.

Imarex is a central exchange with removal of credit risk through clearing. It has the right contract structure, covering the most popular OTC routes, and seems well set to boost overall trading volumes in both tanker and

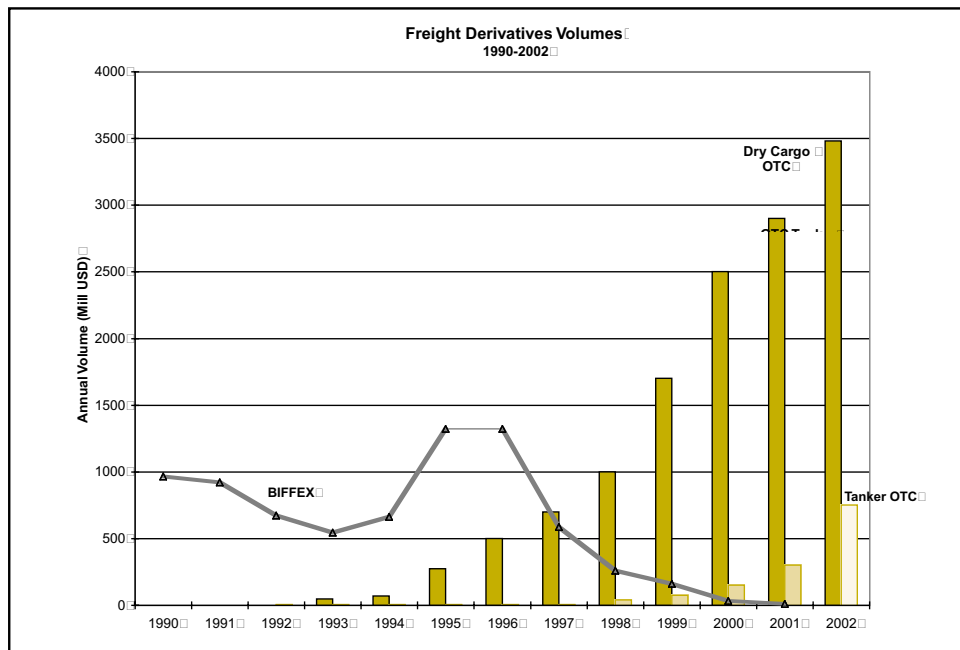


Figure 1: Freight Derivatives Volumes 1990-2002

## IMAREX FUTURES CONTRACTS

<b>Dirty tanker routes</b>	<b>Route</b>	<b>Size</b>
Route 1	Aframax North Sea - Continent	80.000 mt
Route 2	Aframax Caribs - US Gulf	70.000 mt
Route 3	Suezmax West Africa - USAC	130.000 mt
Route 4	VLCC AG - East	250.000 mt
Route 5	VLCC West Africa - US Gulf	260.000 mt
Route 6:	Panamax Caribs - USAC	50.000 mt

<b>Clean tanker routes</b>	<b>Route</b>	<b>Size</b>
Route 7	Medium Range Singapore - Chiba	30.000 mt cpp
Route 8	Medium Range Continent - USAC	33.000 mt cpp
Route 9	Long Range II AG - Japan	75.000 mt cpp

<b>Dry Bulk routes</b>	<b>Route</b>	<b>Size</b>
Route 10	Capesize Richards Bay - Rotterdam	150.000 mt
Route 11	Panamax US Gulf - Japan	54.000 lt
Route 12	Capesize T/C Average	161.000 mt
Route 13	Panamax T/C Average	70.000 mt
Route 14	Handymax T/C Average	45.496 mt
Route 15	Panamax SKAW-GIB-Far east	70.0000 mt

**Table 1: Imarex listed futures contracts**

dry bulk futures and OTC forward markets. An overview of the Imarex listed futures contracts is shown in table 1.

### WHY ARE SHIPPING COMPANIES TRADING DERIVATIVES?

Most of the freight futures and swaps traded by shipping companies have been for near-term, 3-6 months forward, optimisation of vessel trading.

Some of the owner/operators have profited from arbitrage opportunities or spread trading between physical fixtures and deriva-

tives. Their profits in these trades have been at the expense of owners who have neither been using derivatives nor even been watching the forward prices in freight derivatives and bunkers. When the arbitrage trades have included both time charter and voyage-based instruments, oil derivatives have normally been used to cover implicit bunker price risk. An example of one of the basic arbitrage opportunities is taking a vessel on 10-12 months timecharter, selling voyage based futures or OTC forwards based on a simulated trading pattern for the vessel for the first 10 months, leaving the option period

uncovered, and buying the equivalent value of oil futures/options covering the estimated bunkers consumption over the period. Establishing the fair value for a timecharter extension option is not a simple matter of doing a Black-Scholes option value calculation, but requires a detailed assessment of the probabilities of various employment scenarios during the option period and possible redelivery dates for the vessel.

Very few, if any, shipping companies have yet implemented large scale hedging programs based on freight derivatives. However, a number of companies have

experimented with using swaps and futures as a component in their hedging.

A couple of weeks ago, on the same day, two North European shipping companies both reported their financial results for Q1 2002 and their forecast for the full year. One company reported a loss for the first quarter and forecast a bigger loss for the full year. The other company reported a reduced profit from last year, but still expected to achieve its goal of 12% return on capital employed in 2002, even in a very weak freight market. The difference? The second company had a 50% contract coverage for their whole fleet.

Attractive contracts of affreightment are not often readily available. Freight futures contracts are increasingly available, and a mix of COAs and freight derivatives contracts can be an efficient and safe method for hedging, adjusting the market exposure of the company.

### FREIGHT MARKET RISK MANAGEMENT WITH VALUE-AT-RISK

Improved continuity of earnings enables a company to take on more business than it would otherwise be

able to with the same capital base. Thus, risk management in bulk shipping does not necessarily mean less risk-taking, but primarily better risk/return ratios and the ability to have the preferred risk exposure at any stage in the market.

For pool operators and participants, one of the important benefits of an advanced framework for measuring, reporting and managing market risk is increased flexibility. It is possible to measure and adjust the market exposure of each vessel, without taking the vessel out of the pool. This

increases the value of the pool concept for ship owners, and may reduce friction between management and participants in a pool.

VaR (Value-at-Risk) is commonly defined as the maximum expected loss for a specific portfolio or instrument, at a specified confidence level (e.g. 95% or 99%) for a specified period (e.g. daily, weekly, monthly). The three basic methods in wide use for calculating VaR are parametric, historical simulation and Monte Carlo simulation. Each method has its strengths and weaknesses, and togeth-

er they give a more comprehensive perspective of risk.

One of the primary strengths of VaR lies in the fact that it is a comprehensive, aggregate risk measure, capturing all relevant portfolio effects in a summary manner and quantifying diversification effects. VaR as a risk measure has the benefit of simplicity and can be used as the basis of integrating risk management across departments, from each trader up to enterprise level.

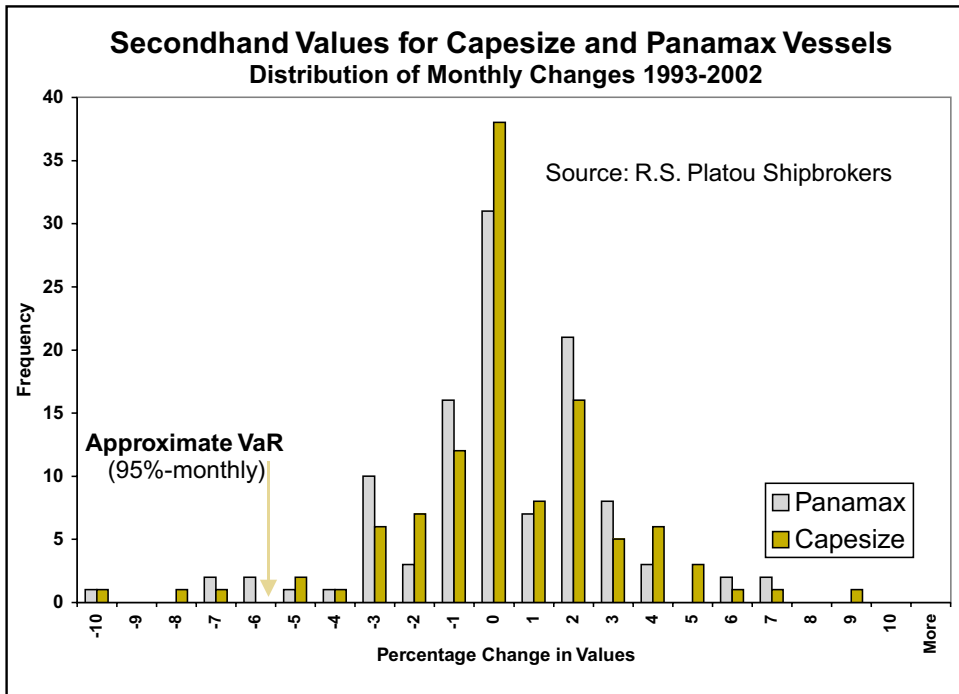
Although operational risk, credit risk and interest rate

risk can be considerable risk elements, the main financial risk in bulk shipping is typically market risk.

Historically, the volatility in e.g. crude tanker freight rates has for long periods been higher than the volatility in crude oil prices. Obviously, second hand vessel prices are strongly correlated with freight rates. As seen in Figure 2, the distribution of monthly price changes for vessels shows a pattern that closely resembles the typical price distribution for freight rates and other commodities.

In addition to VaR, a mod-

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**Figure 2: Distribution of Price Changes for Secondhand vessels**

ern risk management program in shipping needs to include stress testing and extreme events analysis, coupled with a fundamental analysis of some basic high-risk scenarios. VaR cannot replace the very important scenario analysis and cash flow modelling done in many shipping companies, but it can enhance the value of the traditional planning and forecasting activities considerably.

On the basis of VaR, another useful concept is RAROC (Risk-adjusted return on capital), defined as:

$$\text{RAROC} = (\text{Net Returns} / \text{Capital Required to cover all Risks})$$

RAROC is very useful in

shipping for capital allocation and performance measurement, and can be used to set optimal trading limits for chartering or project departments or individual traders.

Physical tanker freight and dry bulk freight are commodities characterized by high volatility and price transparency. Unlike in most other commodities industries, in bulk shipping there is also a liquid market for the production assets (vessels), enabling these to be marked-to-market and easily included in the VaR analysis. This increases the value of VaR in shipping further. In addition to freight and oil (bunkers) price risk, exposure to inter-

est rate risk and to a lesser degree foreign exchange risk is significant for most shipping companies. VaR is a unified measure that allows comparisons, sensitivity analysis and stress testing across asset types and time horizons.

Introducing a risk management framework based on VaR is a very different project in a typical shipping company than in a financial institution or an oil company. Shipping is different when it comes to e.g. size and type of organization, availability of derivatives instruments and price data, and computer systems integration.

VaR is still a foreign con-

cept to many ship owners, business managers and executives in both dry bulk and tanker shipping. However, implementation and effective use of VaR requires cooperation across the organization. One of the first steps to be taken is therefore to provide extensive corporate education and training. Owners, board members and corporate executives have to learn how VaR can be used as an efficient tool without imposing excessive managerial burdens. Once a limit structure based on VaR is established, there is no need to micro-manage. Chartering managers and traders can enjoy the freedom of trading and creative risk taking within the clear limits assigned. While the implementation of a VaR based risk management framework in a bank or energy company typically includes a large scale IT-project and real-time or daily risk reporting, the best approach in a shipping company would normally be a more limited, less systems intensive solution. Against the background of the overall corporate strategy and the company's actual net market position, new projects may be evaluated and trading limits may be revised based on VaR on a weekly or monthly basis.

An example of a shipping company portfolio VaR

chart is shown in Figure 3.

### STRENGTHS AND WEAKNESSES OF VAR IN SHIPPING

Very few other industries in the world have a comparably liquid market for their production assets, enabling marking-to-market and a complete portfolio VaR. Compared to corporate enterprise risk management frameworks in other industries, this increases the value of VaR relative to CFaR (Cash-Flow-at-Risk and EaR (Earnings-at-Risk) for companies in shipping.

Tanker freight shows higher volatility than most large financial markets, but the liquidity in the existing futures, swaps or FFA markets is still limited and prices for forward periods are difficult to observe. While there exists a large amount of good quality historical spot data, historic

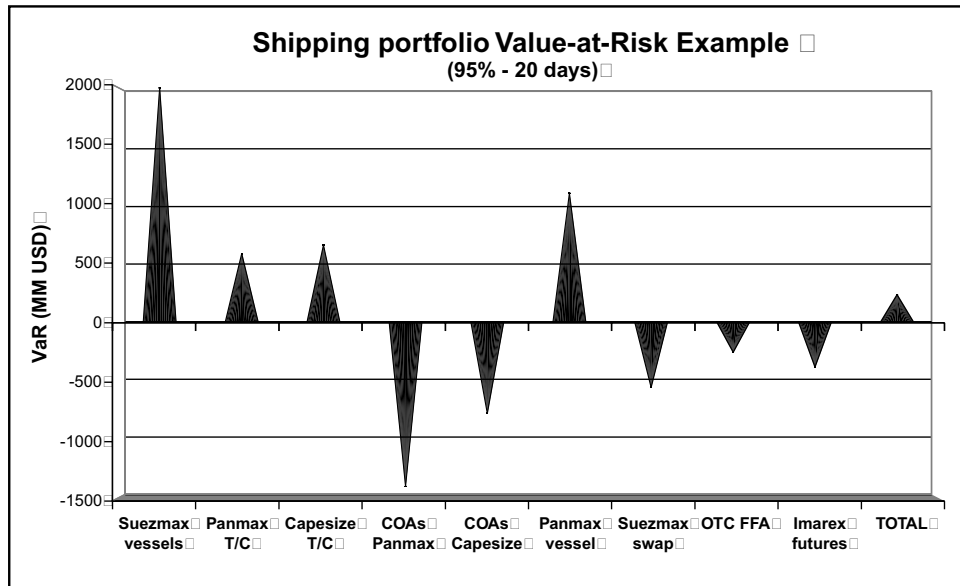


Figure 3: Shipping Portfolio Value-at-Risk Example

data on forward prices are scarce, making computation of volatility and correlation data difficult. This creates more uncertainty in the VaR numbers. In some cases the 15 years of historical BIFFEX futures prices can, however, be a useful input when estimating forward curves and seasonality factors in the dry bulk forward

market.

The VaR framework is very useful and is recommended for setting risk limits, both for investments and trading in shipping. Traditionally, trading limits have been set to restrict e.g. the total number of vessels owned or taken on time charter, or the number of cargoes short

at any point in time. Risk limits like these do not incorporate portfolio effects, and they provide no probabilistic measure of loss. As a result, this may lead to wrong trading decisions. Limits based on VaR can be assigned at division or department level and delegated downward to the charterer or trader level.

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For many shipping companies, a full corporate wide calculation and reporting of VaR on a monthly basis is probably sufficient, at least initially, if their derivatives activities are quite limited. Those companies that follow US accounting practices are subject to new FASB and SEC rules that require extensive risk management reporting from corporations that use derivative transactions to hedge their exposures. VaR based reporting meets those requirements.

#### QUANTIFYING THE BENEFITS OF DERIVATIVES TRADING AND RISK MANAGEMENT

A justified question is "what is the expected RAROC for a derivatives trading and risk management project in shipping". The answer, of course, depends a lot on the company's business model, long term strategy and man-

agement capacity.

The three most common ways of organising freight derivatives trading in a shipping company are the following

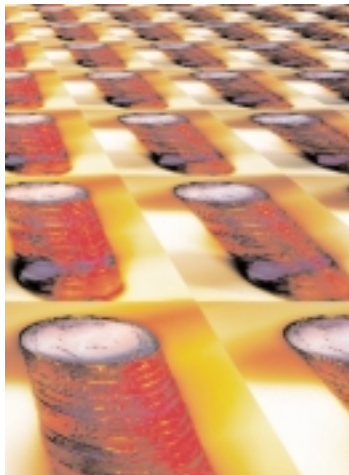
- Integrated with, and measured together with the chartering department
- Separate profit-centre
- Corporate service function, part of the finance/treasury department

If the freight derivatives activities are organized as a separate profit-centre, it is usually easy to see the contribution from trading operations to the bottom-line of the company. However, depending on the strategy for the trading arm, the activities may either decrease or increase the risk exposure of the company as a whole. Unless the company already has some form of VaR based risk management, it may be difficult to

assess the real contribution from derivatives operations to the overall RAROC of the company. A typical situation in a ship owning company is that the company is overall net long, i.e. its equity increases as a result of a freight market increase. In this case the contribution from the derivatives trading operations to the overall company RAROC is obviously much larger if the profits come from trading a ten million USD short derivatives position than from a long position of the same size. This fact should always be reflected in the trading limits of the derivatives operations.

Developing an advanced risk management function with real-time VaR reporting for the total enterprise is typically a large, complex and expensive project. Some shipping arms of large trading companies or oil companies can benefit from

existing corporate risk management infrastructure, and integrate freight derivatives trading and risk management into the existing framework at relatively low cost. Most shipping companies, however, need to build their solution from scratch. There is no fixed answer to the question of how much one should expect to spend. This depends on the size of the company, the capital structure, the business strategy, the derivatives trading strategy and the skills and knowledge of derivatives between top and middle management. While software costs may amount to less than USD 50 000, the real challenge in a VaR implementation project is how to change behaviour and realise the full benefit of the project without unforeseen consequences for the existing operations and organization. Clear goals and careful planning are a must.



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## SINGAPORE SHIP FINANCE FORUM

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Fullerton Hotel, Singapore

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**ORGANIZING  
FREIGHT  
DERIVATIVES  
TRADING AND  
FREIGHT MARKET  
RISK  
MANAGEMENT**

The derivatives business is a rapid growth industry worldwide, and freight derivatives are likely to continue growing in line with the rest of the business. Freight derivatives are gradually becoming standard instruments to be used by all major ship owning corporations. Freight futures and other freight derivatives are simply better suited to meet freight market risk management needs than any other product, but their successful use will require the education, involvement and support of senior management and directors.

Risk-Adjusted-Return-on-Capital from freight derivatives trading and VaR based risk management will normally be highest for those companies that

- Have a significant exposure to the spot market
- Are among the largest in

**A Checklist**

Issue	Description/Comments	OK?
Derivatives strategy	Derivatives trading strategy should be stated in a brief document, approved by Board of Directors	
Management responsibilities	Clear, separate responsibilities within organization allocated for <ul style="list-style-type: none"> <li>- Derivatives trading</li> <li>- Risk management and control</li> <li>- Derivatives reporting and accounting</li> </ul>	
Risk management	Enterprise wide VaR based risk management framework for all assets and liabilities implemented	
Capital allocation	Optimum capital for derivatives trading allocated on basis of expected RAROC	
Reporting	Risk reporting procedures defined and implemented, including derivatives reporting	
Trading limits	VaR based trading limits in place for all units	
Organization	Staff sufficiently trained and with capacity for derivatives trading	
Incentives	Incentives for trading and risk management staff well aligned with RAROC based company goals	
Success criteria	Criteria for success for freight derivatives trading and risk management clearly defined and communicated to all involved	

**Table 2: Checklist when Organizing Freight Derivatives Trading and Freight Market Risk Management**

their category

- Have a trading mentality
- Are willing to invest in preparation, knowledge, staff and tools for trading and risk management

It is generally accepted that the board doesn't need operating expertise in derivatives, but it must have sufficient understanding of the

products and risks to approve the company's derivatives business strategy, limit capital at risk and review periodically the status and results of the derivatives trading. This includes approving written procedures and policies regarding use of derivatives, and establishing an independent unit for measuring and reporting

at regular intervals to the board and senior management.

For a quick, do-it-yourself review of a company's status on freight derivatives trading and risk management, the checklist in Table 2 reflects some of the recommended best practices.

Finn Dalheim is a consultant with Terminsikring AS ([www.terminsikring.com](http://www.terminsikring.com)), a Norwegian independent consulting company (founded 1986) focusing on integrated financial risk management, energy and freight derivatives trading strategies and trading organization development.

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