



# Freight Derivatives

Trading opportunities  
and hedging applications

Presented for:



Bloomberg – Athens, 29 September 2004

## About this Presentation

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- **Objectives**
  - Introduce the freight market
  - Introduce the basic concepts of freight derivatives
  - Discuss the potential applications of freight derivatives
  
- **Outline**
  - Introducing FreightMetrics
  - The underlying market
  - Introducing freight derivatives
  - Trading with FFAs
  - Hedging with FFAs
  - Options
  - The future of freight derivatives

## Introducing FreightMetrics

### What we Do (and not Do)

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- **What FreightMetrics is...**
  - A provider of consulting services and software solutions for measuring and managing **market** and **credit risk** arising from uncertainty in freight rates.
  - Working closely with Shipowners, Shipping Banks, and Freight Traders, in order to **quantify** and **manage** their exposures with respect to freight rates.
  - Transferring best practices and proven methodologies from the area of derivatives and financial risk management to shipping.
- **What FreightMetrics is NOT...**
  - Shipbroker
  - Forecast provider
  - Market news vendor
  - Financial intermediary
- **Our motivation**
  - To increase risk management awareness in the industry, develop a modern framework for measuring freight market risk, promote the use of shipping derivatives in managing risk, and improve decision-making with risk-informed procedures.

# Introducing FreightMetrics

## Services and Products

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- **Training**
  - Public seminars or tailored in-house programs
- **Advisory**
  - Design of hedging programs
    - Quantification of exposure of physical position
    - Hedge recommendations
  - Design of business plans for setting up trading activities
    - Internal procedures
    - Trading rules
- **Independent risk measurement and reporting**
  - Quantification of market risk
    - Physical position
    - FFA position
    - Combined position
  - Quantification of counterparty risk
- **Software for FFA/Risk monitoring and reporting**

# Introducing FreightMetrics

## Who we Are

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- **The people of FreightMetrics combine previous experience in 3 areas:**
  - Shipping finance, financial risk management, and software development
- **Founder: Kyriakos Attikouris**
  - Education:
    - **M.B.A in Finance** University of Rochester
    - **Diploma in Mathematical Finance** University of Oxford
    - **Ph.D (Candidate)** University of Piraeus
  - Professional qualifications:
    - **Financial Risk Manager (FRM)** by GARP (Global Association of Risk Professionals) ([www.garp.com](http://www.garp.com))
    - **Professional Risk Manager (PRM)** by PRMIA (Professional Risk Managers' International Association) ([www.prmia.org](http://www.prmia.org))
  - Work experience:
    - **Citibank – Global Shipping Division:** Industry Analyst (dry bulk), Credit Officer
    - **Athens Derivatives Exchange (ADEX):** Risk Management Officer
    - **Systemic Risk Management:** Senior Manager-Business Development & Risk Analytics ([www.systemic-rm.com](http://www.systemic-rm.com))

My biggest success...

# The Underlying Market

## An Introduction

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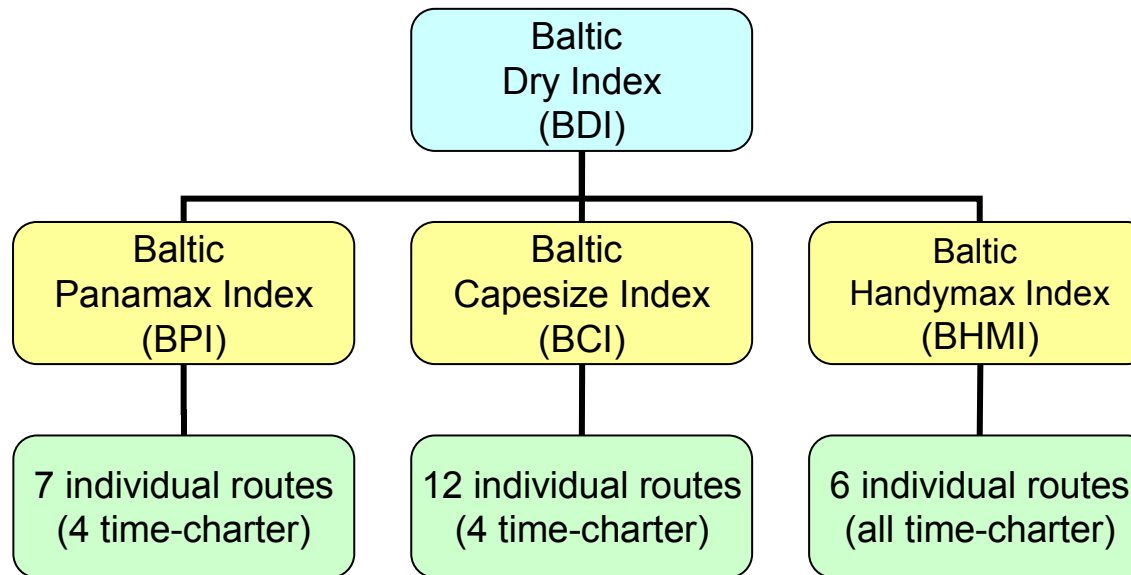
- **What is the underlying asset?**
  - The underlying market is the **freight market** of physical transportation of cargo
  - Prices in the freight market are termed **freight rates** and are expressed in terms of \$/day (“time-charter”) or \$/tonne (“voyage charter”)
  - The freight market is highly segmented and freight rates are specific to:
    - Vessel type
    - Route
    - Duration of charter agreement
- **The role of the Baltic Exchange**
  - The Baltic Exchange is responsible for standardizing a set of routes which serve as the underlying assets for the settlement of freight derivatives.
  - It sets the rules and oversees the process of collecting and processing the brokers’ assessments of freight rates in more than 40 cargo routes.

More can be found at [www.balticexchange.com](http://www.balticexchange.com)

# The Underlying Market

## The Baltic Routes and Indices

- **The Baltic family of routes and indices (dry sector)**



- **Example (BCI – Route 4)**

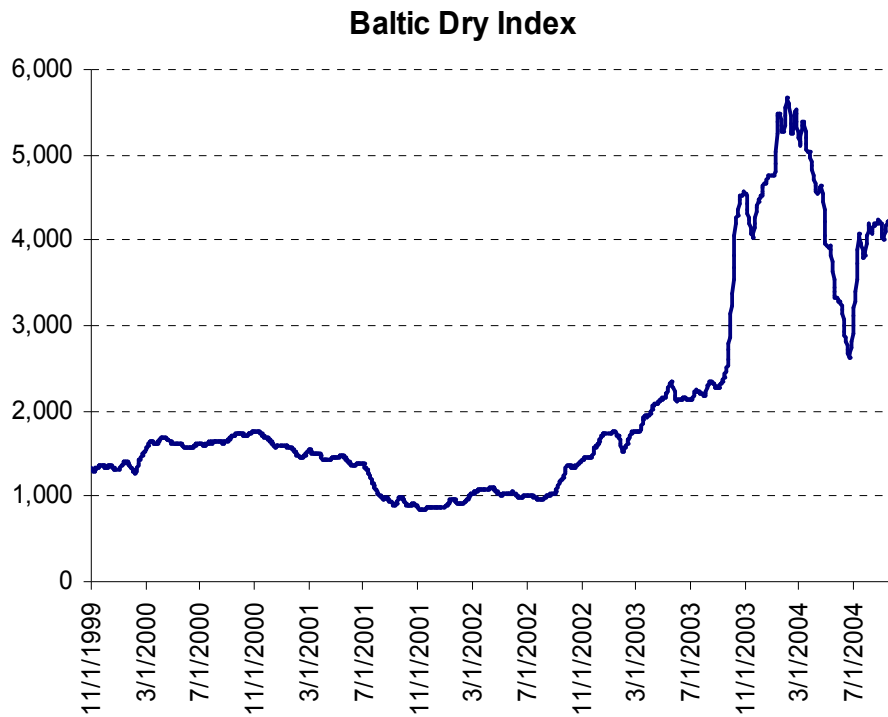
**Route 4**

Richards Bay/Rotterdam, 150,000 mt 10 per cent coal free in and out and trimmed, scale load/25,000 mt shinc discharge. 18 hours turn time at loading port and 12 hours at discharge port. Laydays 25 days forward from date of index, cancelling 40 days forward from date of index. Vessel's age max. 15 years. Freight based on metric tonnes. 3.75 per cent total commission. Nominal Weighting =5%

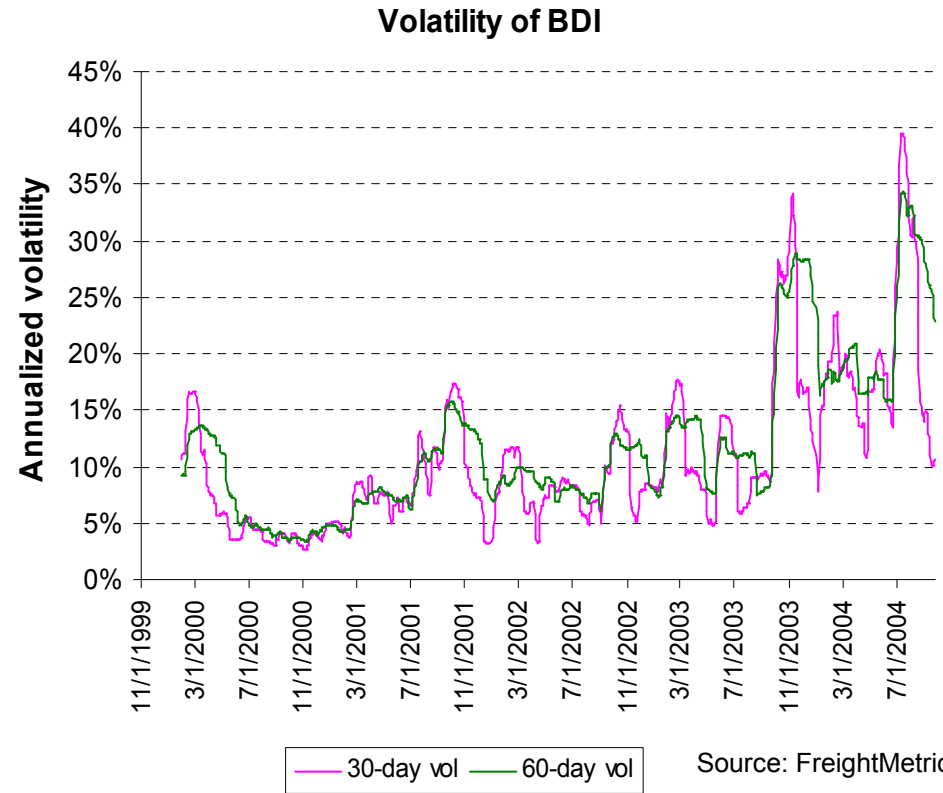
# The Underlying Market

## A Closer Look

- The Baltic Dry Index (BDI)



Source: Baltic Exchange



Source: FreightMetrics

## The Underlying Market

# Freight as an Alternative Asset Class

- Comparing freight rates against other asset classes

Performance 2000-2004		Annualized Return	Annualized Volatility	Sharpe Ratio	Correlation with BDI
<b>BALTIC DRY INDEX</b>	<b>BDI</b>	<b>26.85%</b>	<b>15.08%</b>	<b>1.45</b>	
Dow Jones Industrial Average	DJI	-0.33%	19.58%	-0.27	0.46%
NASDAQ 100 Index	NDQ	-6.60%	43.02%	-0.27	1.42%
Lehman Bond Composite - Global	BNDGLB	7.88%	12.94%	0.22	-0.62%
Lehman Bond Composite - U.S.	BNDUS	7.49%	4.24%	0.59	1.74%
USD 1-Month LIBOR	US0001M	-22.82%	15.53%	-1.79	-4.20%
USD 6-Month LIBOR	US0006M	-19.51%	22.06%	-1.11	-3.04%
EUR/USD Exchange Rate	EURUSD	4.44%	10.80%	-0.05	-0.27%
USD/JPY Exchange Rate	USDJPY	1.76%	9.51%	-0.34	-0.82%
Goldman Sachs Commodity Index (GSCI) - Spot	GNX	12.78%	22.69%	0.34	-0.77%
GSCI Agricultural Sub-index	GKX	2.86%	16.06%	-0.13	3.00%
GSCI Industrial Metals Sub-index	GYX	5.69%	15.92%	0.04	7.63%
GSCI Energy Sub-index	GJX	17.06%	33.63%	0.36	-1.25%
GSCI Precious Metals Sub-index	GPX	10.75%	14.71%	0.39	0.15%

Source: FreightMetrics

## Introducing Freight Derivatives

# The History of Freight Derivatives

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- **Historical development of freight derivatives**
  - Freight derivatives existed since 1985 with the creation of the BFI (Baltic Freight Index), a basket of individual dry cargo routes. This index served as a settlement mechanism for freight futures listed on BIFFEX (subsequently merged with LIFFE; contracts de-listed in April 2002)
  - Since 1992, the individual shipping routes can be traded “over the counter” (i.e. outside an organized exchange) in the form of Forward Freight Agreements (FFAs).
  - Volumes have been growing steadily ever since, picking up significant momentum over the past couple of years.
  - New participants enter the market at a pace of 2-3 new counterparties each month.
  - The Greek shipping community (owning or controlling about 20% of the world fleet) has not yet fully embraced this new tool (only about 1% of the total FFA trades is attributed to Greek interests)
  - New products are coming out: e.g. SPFAs (Sale & Purchase Forward Agreements)

# Introducing Freight Derivatives

## The Basics of FFAs

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- **What is a Forward Freight Agreement (FFA) ?**
  - FFAs are principal-to-principal forward deals, bought or sold on a specific Baltic route at an agreed rate, quantity or duration, and date in the future. They are settled (in cash) against the appropriate physical index at the end of each agreed period.
- **How do FFAs work?**
  - When the agreed time has expired and the final settlement price is higher than the agreed rate, the seller compensates the buyer the difference between the agreed price and the settlement price; if the price is lower the buyer compensates the seller.
  - The standard final settlement price is typically made up of the average of the last 7 Baltic Exchange published index days of the relevant month for trades on individual routes, and an average of all index days for period trades, although this can vary as agreed between counterparties.
  - The party that owes monies at settlement produces an invoice with all bank details included. The payment between the two parties is made by telegraphic transfer in US Dollars within 5 London business days following the settlement date.
  - The commission is the percentage as agreed, payable by both counterparties on the basis of the agreed fixed contract price x quantity / duration (i.e. the “notional” value of the deal).

# Introducing Freight Derivatives

## Practicalities of FFA Trading

- **Trading process**

- To initiate an FFA transaction, one needs to specify: route (incl. duration or quantity), maturity, and settlement formula (basically, all terms and conditions can be tailor-made and negotiated between the two parties). Then, the process goes as follows:
  - Price discovery through brokers
  - FFA price negotiation
  - Counterparty clearance
  - Documentation (the main contract in use is a standard FFABA contract, but there are also company specific contracts in use)

- **Standard practices in FFA trading**

	<b>Usual practice</b>	<b>Possible deviations</b>
Commission	0.25% (dry), 0.50% (wet)	Discount for (very) large volumes
Settlement	average of last 7 days (all index days for period trades)	some other period (negotiable)
When due	5 London business days	up to 7 days
Security / collateral	no security asked	Vessel mortgage, escrow account, Letter of Credit, NOS

# Introducing Freight Derivatives

## Users and Applications of FFAs

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- **Applications**
  - Traditional uses:
    - Hedging (single exposure)
    - Speculation (directional trading)
    - Arbitrage (difficult due to lack of tradable underlying)
  - Modern uses:
    - Hedging (portfolio approach)
    - Speculation (relative performance / spread trading)
    - Strategic uses / structuring in chartering
- **Major players**
  - Shipowners: Armada, Bocimar, Coeclerici
  - Charterers: Cargill, RWE, EDF
  - Banks: Goldman Sachs, Morgan Stanley, Deutsche Bank, RBS

# Introducing Freight Derivatives

## Market Size and Liquidity

- Estimated size of FFA market**

- Estimated annual dollar turnover: \$25 billion in notional value of freight (dry)
- Estimated annual cargo turnover: 1.3 billion tonnes of cargo (vs. physical: 1.6 billion)
- Estimated volume of trades: 8,000 transactions (dry; up from 5,000 in 2003)

**Number of traded contracts estimated for 2004: 8,000**

<b>Panamax (60%)</b>	<b>4800</b>	<b>Capesize (30%)</b>	<b>2400</b>	<b>Handysize (10%)</b>	<b>800</b>
T/C avg 60%	2880	RB/Rott 75%	1800	T/C avg 75%	600
2A 15%	720	Bolivar 10%	240	M2 10%	80
3A 15%	720	T/C avg 10%	240	1A 10%	80
Other 10%	480	Other 5%	120	Other 5%	40

Source: FIS

**Daily conversion (assuming 250 trading days)**

<b>Panamax (60%)</b>	<b>19.2</b>	<b>Capesize (30%)</b>	<b>9.6</b>	<b>Handysize (10%)</b>	<b>3.2</b>
T/C avg 60%	11.5	RB/Rott 75%	7.2	T/C avg 75%	2.4
2A 15%	2.9	Bolivar 10%	0.9	M2 10%	0.3
3A 15%	2.9	T/C avg 10%	0.9	1A 10%	0.3
Other 10%	1.9	Other 5%	0.5	Other 5%	0.2

# Introducing Freight Derivatives

## Issues for Consideration

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- **Liquidity**
  - FFAs is an OTC “order-driven” market (absence of market-makers)
- **Pricing**
  - In most commodity markets, forward prices are calculated based on the argument of “no arbitrage” ( $Forward Price = Spot Price + Cost of Carry - Convenience Yield$ ). This argument does not hold for shipping derivatives due to the non-storable nature of freight. Hence FFA prices are a pure reflection of market expectations. This characteristic reinforces the role of the FFA market as a price discovery mechanism, but, on the other hand, it undermines its role as a hedging vehicle.
- **Basis risk**
  - Imperfect hedging due to possible location, vessel, or time discrepancies.
- **Credit risk**
  - Normally, there is no deposit or variation margin requirement for the principals involved in the transaction.

# Introducing Freight Derivatives

## Current Forward Curve

- **How does the forward curve look at present?**
  - Current forward rates and term structure of the Handymax market (bootstrapped from market quotes by FIS; Sep 27, 2004)

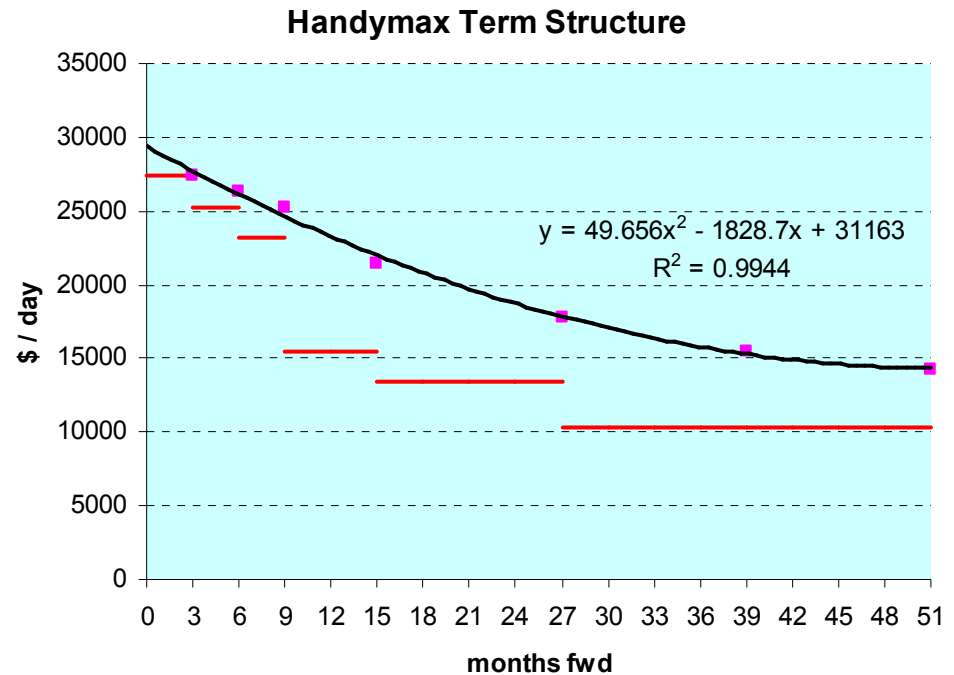


Monday 27<sup>th</sup> September 2004 1 of 1

**TC Average FFA Prices:**

Month		
Q4	27000	27750
Q1	24500	26000
Q1+2	23500	25000
Calender (2005)	19000	20750
Calender (2006)	13000	13750
Calender (2007)	10000	10500
Calender (2008)	10000	10500

Source: FIS

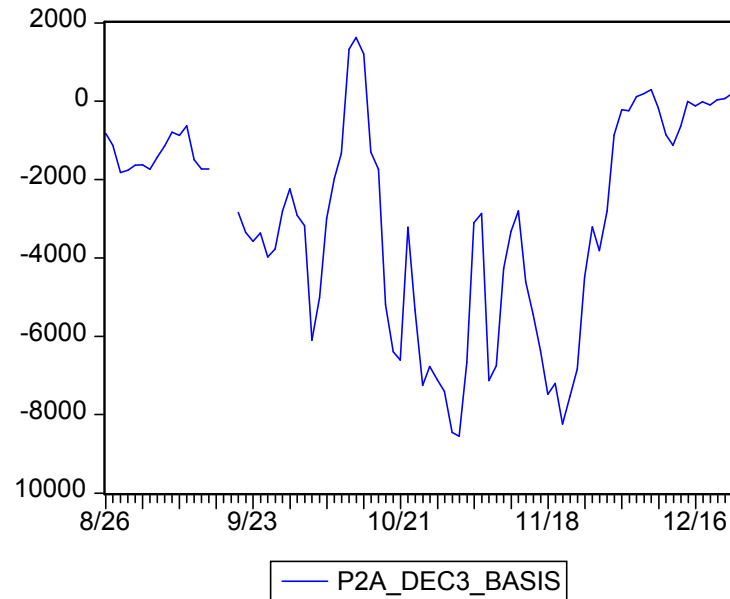
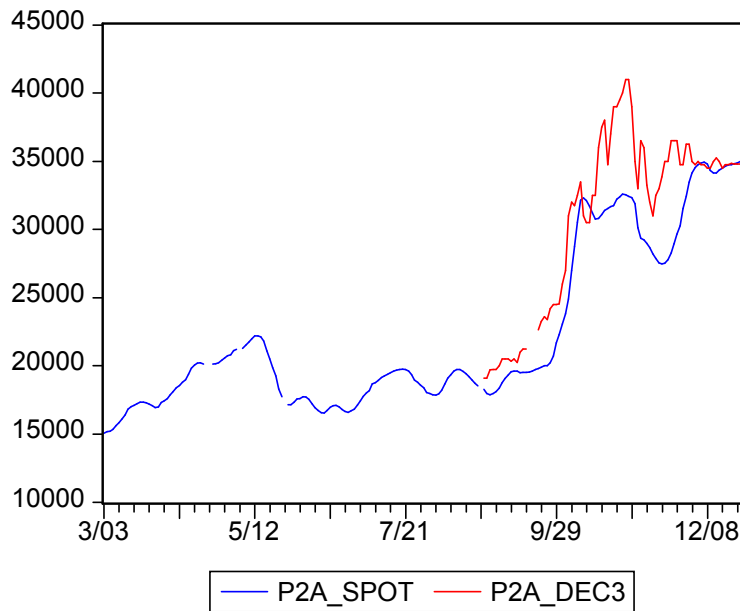


Source: FreightMetrics

# Trading with FFAs

## Directional Trading

- Example of a directional trade**
  - An FFA trader is considering buying the Dec03 contract on BPI 2A. The contract has been trading at a premium to the spot rate (“contango”) for much of its early lifetime. On mid-October the two prices crossed each other and the trader thought it would be a good opportunity to “go long”. So, he buys one Dec03 contract at \$32,500 (FIS quote on October 15<sup>th</sup>). In the days that followed, the Dec03 rate climbed over \$40,000.

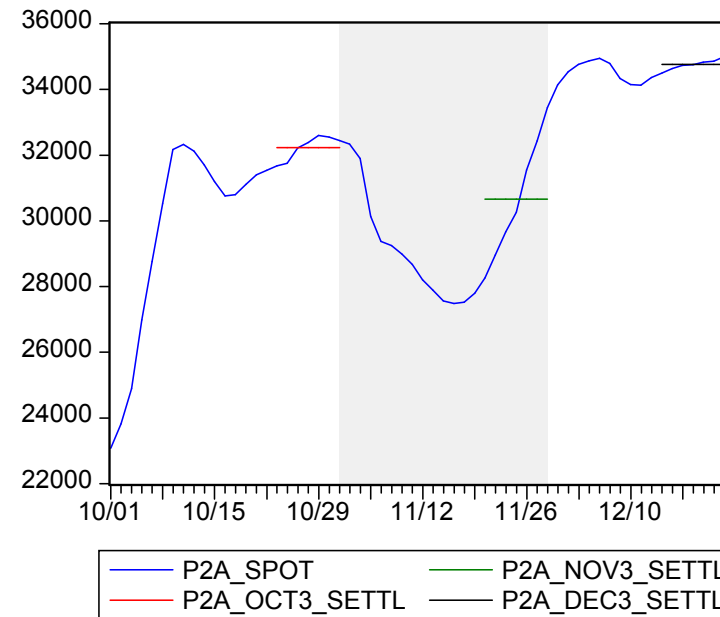
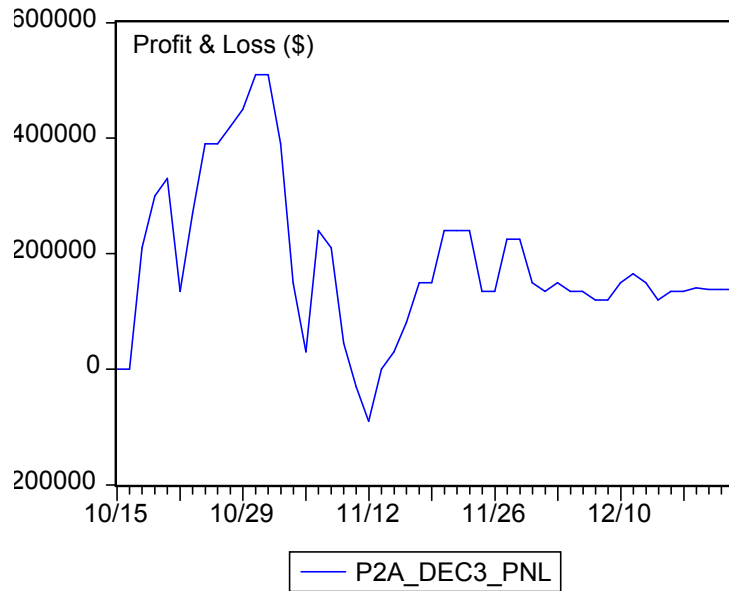


# Trading with FFAs

## Directional Trading

- Facts about directional trading**

- As is always the case in shipping, timing is crucially important (see charts below).
- It is imperative to develop a trading mentality, stringent “rules of engagement”, and an appropriate “exit strategy”
- It is proven empirically that FFA prices are more volatile than underlying spot rates (a distinct characteristic not seen in other -more mature- futures markets)



# Trading with FFAs

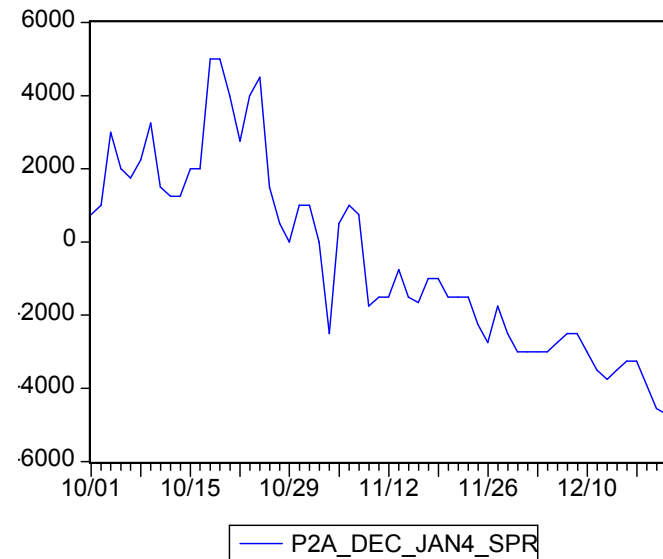
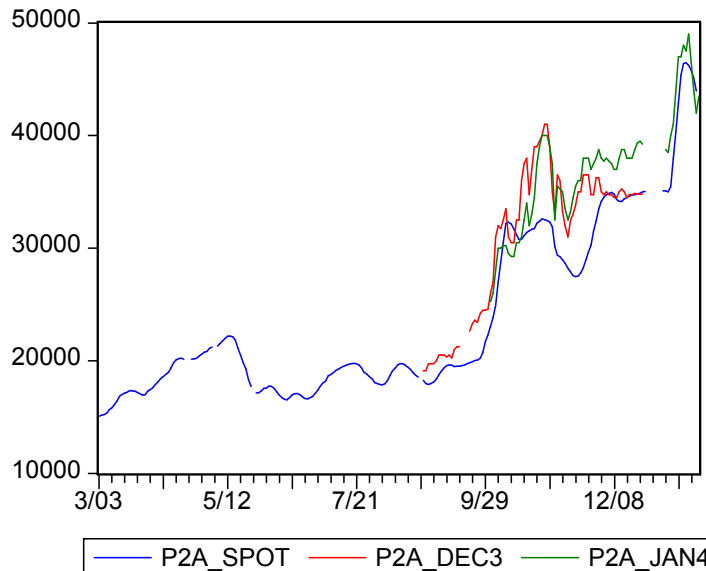
## Spread Trading

- **Example of a time spread**

- On October 20<sup>th</sup> the spread between BPI 2A Dec03 and BPI 2A Jan04 peaked at \$5,000, with the contract closest to maturity some \$6,390 away from spot. One could bet that the gap would narrow and that the nearest month would converge faster to spot.
- So, suppose we sold Dec03 at \$37,500 and bought Jan04 at \$32,500 (source: FIS)
- At expiry of Dec03 (settlement: \$34,835) we would have the following results:

- Dec03 (1 short contract):  $(-1) \times (\$34,835 - \$37,500) \times 60 \text{ days} = + \$159,900$
- Jan04 (1 long contract):  $(+1) \times (\$39,250 - \$32,500) \times 60 \text{ days} = + \$405,000$

Total profit:  
\$564,900



## Trading with FFAs

# Spread Trading

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- **Facts about spread trading**

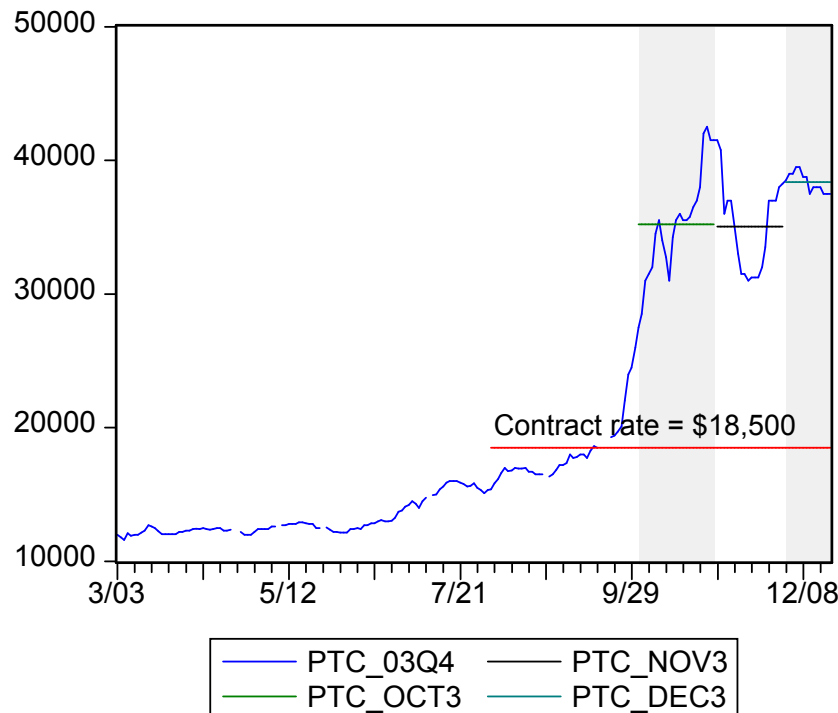
- Similar techniques can be applied in inter-market spreads (i.e. between different routes), which can be motivated by our views about the relative performance of each particular route. That is, we sell the route that we believe will underperform relative to another route which we believe will show strength.
- However, there is an added complexity in inter-market spreads because the notional values of the contracts do not necessarily match (i.e. different duration or quantity specifications).
- Spreads are considered lower-risk strategies, since they involve opposite positions in two -supposedly correlated- contracts. Indeed, the Dec03 and Jan04 contracts in the previous example exhibit a positive correlation of 74%.
- However, one must consider that a spread involves 2 separate deals, which means double the effort, double the commission and (potentially) double the counterparty risk (if both legs are profitable, as in the previous example)
- For a spread to be effective, both legs must be executed simultaneously. Otherwise, it can destroy the whole strategy and you may be left with one leg only (which is a very different strategy than the intended one). This is potentially difficult and requires exceptional execution skills.

# Hedging with FFAs

## A Static Hedge

- **Example of a static hedge**

- An owner decides to lock in a rate for his ship to protect against a possible decline in freight rates. On September 15<sup>th</sup> 2003, he sells an FFA on the Q4 TC average of BPI. The contract rate is \$18,500 (FIS quote) and the settlement basis is the average of all index days of each month (Oct, Nov, Dec: 92 days)



- Oct03 settlement:  $(-1) \times (\$35,207 - \$18,500) \times 31 \text{ days} = -\$517,917$
- Nov03 settlement:  $(-1) \times (\$35,038 - \$18,500) \times 30 \text{ days} = -\$496,140$
- Dec03 settlement:  $(-1) \times (\$38,357 - \$18,500) \times 31 \text{ days} = -\$615,567$
- Total settlement:  $-\$1,629,624$
- So, was that a successful hedge?  
WE CAN'T TELL, until we know the other part of the equation: the actual fixture of the hedged vessel in the physical market.  
Do not judge the hedge alone!

# Hedging with FFAs

## A Portfolio Approach

- Combining FFAs with the physical position of a fleet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Days	31	28	31	30	31	30	31	31	30	31	30	31	
<b>Physical Position</b>													
Vessels chartered-in	13	10	8	4	3	2	2	2	1	0	0	0	0
Vessels chartered-out	-13	-12	-10	-8	-8	-8	-6	-6	-5	-5	-4	-4	-4
Net vessels	0	-2	-2	-4	-5	-6	-4	-4	-4	-5	-4	-4	-4
Capacity (days)	403	280	248	120	93	60	62	62	30	0	0	0	0
Commitments (days)	-403	-336	-310	-240	-248	-240	-186	-186	-150	-155	-120	-124	-124
Net days - Physical	0	-56	-62	-120	-155	-180	-124	-124	-120	-155	-120	-124	-124
Avg. TCE paid	18,000	18,000	19,000	17,500	17,500	16,500	16,500	16,500	15,000	15,000	0	0	0
Avg. TCE earned	23,000	24,000	20,000	19,000	19,000	19,000	18,000	18,000	16,000	16,000	15,000	15,000	15,000
<b>FFA Position</b>													
Contracts bought	0	3	3	0	0	0	0	0	0	0	0	0	0
Contracts sold	0	1	1	2	2	2	2	2	2	1	1	1	1
Net contracts	0	2	2	-2	-2	-2	-2	-2	-2	-1	-1	-1	-1
Equiv. Capacity (days)	0	84	93	0	0	0	0	0	0	0	0	0	0
Equiv. Commitments (days)	0	-28	-31	-60	-62	-60	-62	-62	-60	-31	-30	-31	-31
Net days - FFAs	0	56	62	-60	-62	-60	-62	-62	-60	-31	-30	-31	-31
Avg. FFA rate (long)	20,000	20,000	20,000	19,000	19,000	19,000	0	0	0	0	0	0	0
Avg. FFA rate (short)	22,000	22,000	22,000	21,000	21,000	21,000	19,000	19,000	19,000	17,000	16,000	16,000	16,000
<b>Combined Position</b>													
Overall net exposure	0	0	0	-180	-217	-240	-186	-186	-180	-186	-150	-155	-155
Average long rate	18,000	18,462	19,273	17,500	17,500	16,500	16,500	16,500	15,000	0	0	0	0
Average short rate	23,000	23,846	20,182	19,400	19,400	19,400	18,250	18,250	16,857	16,167	15,200	15,200	15,200
<b>Mark-to-Market</b>													
Physical - Long	1,612,000	980,000	496,000	300,000	139,500	90,000	31,000	-31,000	45,000	0	0	0	3,662,500
Physical - Short	403,000	840,000	-310,000	-240,000	0	240,000	186,000	372,000	-75,000	0	-60,000	0	1,356,000
FFA - Long	0	126,000	93,000	0	0	0	0	0	0	0	0	0	219,000
FFA - Short	0	14,000	31,000	60,000	124,000	180,000	124,000	186,000	150,000	31,000	15,000	31,000	946,000
<b>TOTALS</b>	<b>2,015,000</b>	<b>1,960,000</b>	<b>310,000</b>	<b>120,000</b>	<b>263,500</b>	<b>510,000</b>	<b>341,000</b>	<b>527,000</b>	<b>120,000</b>	<b>31,000</b>	<b>-45,000</b>	<b>31,000</b>	<b>6,183,500</b>
<b>Forward curves</b>													
													Basis? 0
FFA Market	22,000	21,500	21,000	20,000	19,000	18,000	17,000	16,000	16,500	16,000	15,500	15,000	15,000
MTM curve	22,000	21,500	21,000	20,000	19,000	18,000	17,000	16,000	16,500	16,000	15,500	15,000	15,000

## Options

# A Short Note on Options

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- **How do freight options work?**
  - Calls and Puts on Baltic routes
  - Same settlement mechanism as FFAs
  - Vast choice of strategies
- **How to price a freight option?**
  - Black-Scholes model not suitable for pricing freight options
  - A freight option is in fact a stream of asian-type options with interim settlements
  - Black-Scholes assume normality of returns and lognormal random walk for the underlying price
  - Freight rates may exhibit more complex dynamics, such as cyclicity (mean reversion), seasonality or jumps
  - What is an appropriate model? Monte-Carlo simulation

Price Calculator

## The Future of Freight Derivatives

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- **Increase in trading volumes / liquidity**
  - More industry participants (especially shipowners)
  - More hedge funds / professional asset managers
  - Electronic trading
- **New products**
  - More options
  - Structured products
  - Derivatives on scrap prices
  - Derivatives on secondhand values
- **New research**
  - More academic research
  - More accurate models for pricing options