A STUDY OF PROSPECTS OF FUEL PRICE RISK MANAGEMENT IN INDIAN CIVIL AVIATION INDUSTRY

A Dissertation report submitted in partial fulfillment of the requirements for MS-Oil Trading (2005-07)

By
Deepak Dharwal
R130105010

Guide
Prof. A. Arora
Associate Professor

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES, NCR

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Executive Summary

In today's world of volatile Aviation Turbine Fuel (ATF) prices, hedging has become crucial to business survival for most successful companies in the airline industry. For the airlines industry, the existence of hedging strategies adds significantly to a company's value.

Why hedge ATF? ATF price volatility has a significant impact on the planning decisions, budgets and cash flows of consuming companies. The nature of risk exposure of an organization to fluctuations in ATF prices would depend considerably on its position in the airlines value chain. Price risk management of oil is a critical requirement for governments, particularly in import-dependent, energy-deficient countries. It makes business sense for public sector stakeholders to develop some sort of hedging programme to insure that they are protected against a collapse or a run-up in oil prices.

This study explores into the manner in which hedging can be used to mitigate the risks of price hikes. The research aims to justify the crucial benefits of hedging in protecting the bottom-line.

The principal goal of hedging is not to make money, but to prevent losses. Passive hedging is used by highly risk-averse companies that would like to be completely certain of their future cash flows through hedging of their entire risk exposures. This is done by locking a specific price either through long- term contracts between supplier and buyer, or through a derivatives contract such as futures, forward or swaps, available on most leading commodity exchanges or as over-the-counter (OTC) bilateral contracts.

Active hedging is an approach by which a company seeks to achieve a balance between hedging risk and the cost of hedging by hedging only part of its overall exposure either through a long-term contract or a derivative instrument, and keeping the remainder of the exposure un-hedged so as to benefit from favorable market movements, either through exercise of options or deals in the spot market.

The two primary instruments used to hedge are futures and options. While companies are of course free to choose hedging with options to make money, entities such as public utilities or governments should refrain from hedging as a source of extra profits. Rather, their policymakers should only look upon hedging as a means to stay within budget forecasts, to ensure certainty of cash flow and, by stabilizing energy prices, protect the economy from shocks.

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This is to acknowledge with thanks the help, guidance and support that I have received during the completion of my dissertation.

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Deepak 05\05\07

Deepak Dharwal
Roll No: R130105010
M.S. (Oil Trading)

DECLARATION BY GUIDE

This is to certify that the dissertation report on "A STUDY OF PROSPECTS OF FUEL PRICE RISK MANAGEMENT IN INDIAN CIVIL AVIATION INDUSTRY" submitted to the University of Petroleum & Energy Studies, Gurgaon, by Deepak Dharwal, in partial fulfillment of the requirement for the award of the degree of M.S. (Oil Trading) is a bonafide work carried out by him under my supervision and guidance.

This work has not been submitted anywhere else for any other degree/diploma. The original work was carried out during October 2006 to May 2007 at UPES, NCR Campus, and Gurgaon, India.

Dated 5th May 2007

Abhimanyu Arora
Associate Professor

Chapter: 1

Introduction

Fuel costs comprise a major portion of operating expenses in the Airline industry. For most airlines, it is the second largest expense category behind labor. Thus when oil prices nearly double, as they have between 2004 and 2005, dramatic increases in jet fuel costs can create havoc with an airline's profitability. Given the extreme volatility of fuel prices, how does an airline hedge its costs and plan for future business operations?

For many airlines, the answer is that they hedge fuel costs with one or more financial derivatives. The most popular hedge instruments include futures, forward and swap contracts. We consider each derivative and briefly describe how they work.

A futures contract is an obligation, and in the case of fuel costs, airlines might buy oil futures contracts to hedge jet fuel prices. The major energy exchanges that trade oil futures contracts are the New York Mercantile Exchange (NYMEX) and the International Petroleum Exchange of London (IPE). Purchase of oil futures means that the airlines is "long" the commodity and has entered into an agreement to buy oil at the futures price upon expiration of the contract. If energy prices do rise, the airlines will profit from its long futures position and the gains will offset the fact that it must now purchase jet fuel at a higher price. However, a futures hedge also means that if energy prices fall, the airlines will lose money in its futures position, offsetting any operating gain from buying jet fuel at lower prices. Thus, futures hedging locks in the net cost of using the commodity, in this case jet fuel.

An effective hedging strategy must consider a number of risk management issues. First, the airlines must decide how much of its projected fuel usage it wishes to hedge. At one extreme, the airlines purchases enough futures contracts to hedge 100% of anticipated fuel consumption, and at the other extreme, the airlines chooses to speculate that energy prices will fall and therefore does no hedging. A second consideration is how oil futures prices move relative to jet fuel costs. Since no jet fuel futures contract exists, the airlines must enter into what is known as a cross commodity hedge and determine the appropriate hedge ratio based on relative price movements. Finally, airlines must decide if it really wants to take delivery of the purchased oil. Since this is a cross commodity hedge, the airlines has no productive use for barrels of oil directly and would likely choose to take an offsetting position (i.e., sell the oil futures) just before contract expiration.

Perhaps a more straightforward risk management strategy is for the airlines to hedge with a forward contract. Like a futures contract, a forward contract is an obligation to buy or sell an asset. However, now the airlines contracts directly with the seller to purchase jet fuel in the future. In addition to the underlying commodity now being jet fuel, the airlines can also specify the time and place of delivery. Of course, there are disadvantages to entering into a forward position. Liquidity, or the ability to find a willing seller of jet fuel, is likely more limited than the case of futures contracts. Moreover, should the seller of the forward contract default, the airlines would be left without jet fuel being delivered when needed. Conversely, futures contracts traded on an exchange have institutional mechanisms that make default (credit) risk very small.

The third popular hedging instrument is a commodity swap. A commodity swap can be thought of a series of stacked forward contracts. For example, the airlines enter into a 5 year swap guaranteeing a fixed price of jet fuel at six month intervals. Thus, the swap is similar to buying forward contracts all at once that expire in 6 months, 1 year, 1 ½ years, all the way through 5 years. However, in a commodity swap, there is usually not an exchange of the underlying, in this case the jet fuel. Instead, if 6 months after the start of the swap, jet fuel prices are above the fixed price, the swap seller pays the airlines the difference. If jet fuel prices fall below the fixed price, the airlines will then pay the swap seller. Futures, forward and swap contracts are three examples of financial derivatives that successful airlines use to manage their fuel price risk and plan for business operations. One successful airlines, Southwest, entered the year hedging 85% of its anticipated fuel needs for 2005. Southwest locked in the net price of oil at $26 per barrel, well below the $50 level currently experienced. They have also hedged a good portion of their fuel needs for 2006-2009. While they may eventually profit from these hedge positions, the important point to remember is that they can now plan for future business operations knowing exactly what their fuel costs will be.

Chapter II

Literature Survey

According to Patrick J. Cusatin and Martin R. Thomas [1], "each market has unique set of characteristics that make Risk Management a challenge. In some markets hedging is a simple task that requires little effort and monitoring. In others it's a daily activity that requires constant monitoring. The tools required to establish and manage effective hedge may appear complex and specific to each market."

According to David Long [2], "Fuel costs are typically the second highest expense (behind salaries) for airlines, and the most volatile. Airlines would like to protect it against price increases, but benefit from price declines. In the books various air turbine fuel hedging strategies have been discussed, how airlines can hedge their input cost of ATF in the exchanges and over the counter."

By Ashwani Phadnis (IA may hedge on ATF), use of RMP (Risk management policy) AI board, at its last meeting, approved the `risk management policy' (RMP) that outlines the broad guidelines, which the airline will follow for hedging to meet its fuel requirements. "AI hopes to be able to start hedging latest by mid-February. Ernst and Young (E&Y) has applied to the Reserve Bank of India for the various permissions which are required. Simultaneously, work has also begun to appoint authorized dealers who will be able to carry out hedging,"

References:

1. Cusatin ,Patrick J, Thomas, R. Martin , Hedging Instrument and Risk Management, Mc Graw Hill 2005
2. Long, David ,Oil Trading Manual, Woodwork Publishing 1996

Chapter III

Research Methodology

Research Aim

A study of prospects of fuel price risk management in Indian civil aviation industry

Research Process

- Assessment of the current trends in the domestic civil aviation industry.
- Analysis of annual reports of domestic civil airline companies to understand and analyze the operating cost structure of typical domestic airlines
- Derivative Strategies to manage fuel price risk, using Options, Caps, Floors, Collars, Swaps., etc and evaluating their effectiveness
- Comparison with and without using options

Research Tools

- Corporate Annual Reports (domestic airlines)
- Derivatives tools like options, collars, caps, floors etc

Research Limitations

- Lack of publicly available information
- Non disclosure by aviation companies of their hedging strategy

Chapter IV

Indian Civil Aviation Industry - An Assessment of Current Trends

This chapter focuses on evaluation of the current state of passenger airlines industry in India. The coverage includes details about the major passenger airlines players in India including their fleet position, percentage traffic share and percentage aircraft movement share. It also includes a perspective on the expansion plans of various airlines. The traffic forecast and change in position of market share of full service carriers and low cost carriers is also studied.

AIRLINES IN INDIA

With the emergence of low cost carrier in the year 2003, the number of airlines operating in the domestic circuit of Indian sky has been increased up to 12. These passenger airlines may be broadly classified in following three categories

1. Government Owned Airlines
2. Private Regular Airlines (Full service airlines)
3. Private Low cost airlines.

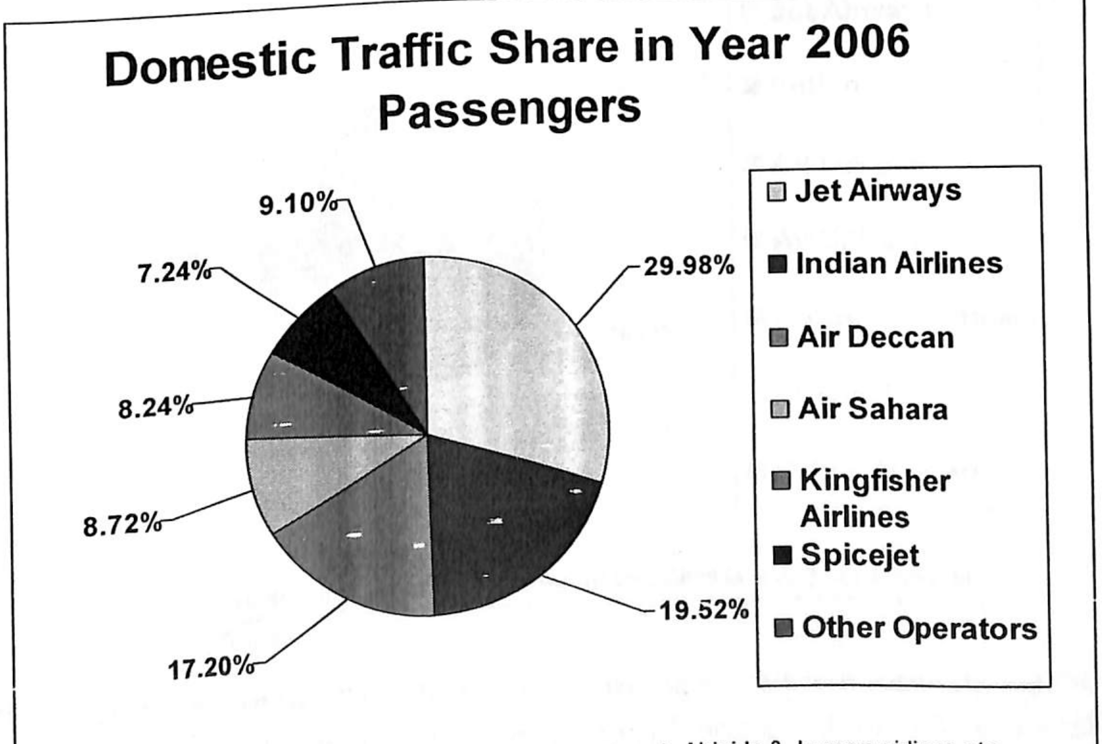
The details of main airlines operating in the domestic circuit and their fleet size are given below in the table:

Sr. No.	Airlines	Category	Fleet Size	No. of Destinations	Year of Inception
1	Indian (i/c Alliance)	Govt. owned	70	58	1953
2	Air India	Govt. owned	38	44	1932
3	Jet Airways	Pvt Reguiar	53	43	1991
4	Air Sahara	Pvt Regular	29	28	1991
5	Kingfisher	Pvt Regular	18	15	2005
6	Air Deccan	Pvt low cost	40	57	2003

7	Spice Jet	Pvt low cost	9	11	2005
8	Indigo	Pvt low cost	5	12	2006
9	Jagson	Pvt low cost	3	7	1992
10	Paramount	Pvt low cost	5	6	2005
11	Go Air	Pvt low cost	7	11	2006

 # Source: Websites of respective airlines

It is evident form the table that, in past two years 5 new airlines started operating in Indian domestic circuit. Most of them are the Low cost carriers after the Jet airways and Air Sahara, Kingfisher is the only new Full service private airline. Presently 277 aircrafts are operating in Indian sky out of which the major share 25.27 % belongs to the government owned Airlines (Indian & Alliance), after merger of Jet airways and Air Sahara it will have maximum fleet size of 73 aircraft with approximately 29.6% fleet share. Where as the main low cost carrier Air Deccan is having a fleet share of 14.44%. With the fleet size of 40 aircrafts the air Deccan is coving as many as 57 destinations throughout the country which is almost equal to Indian.

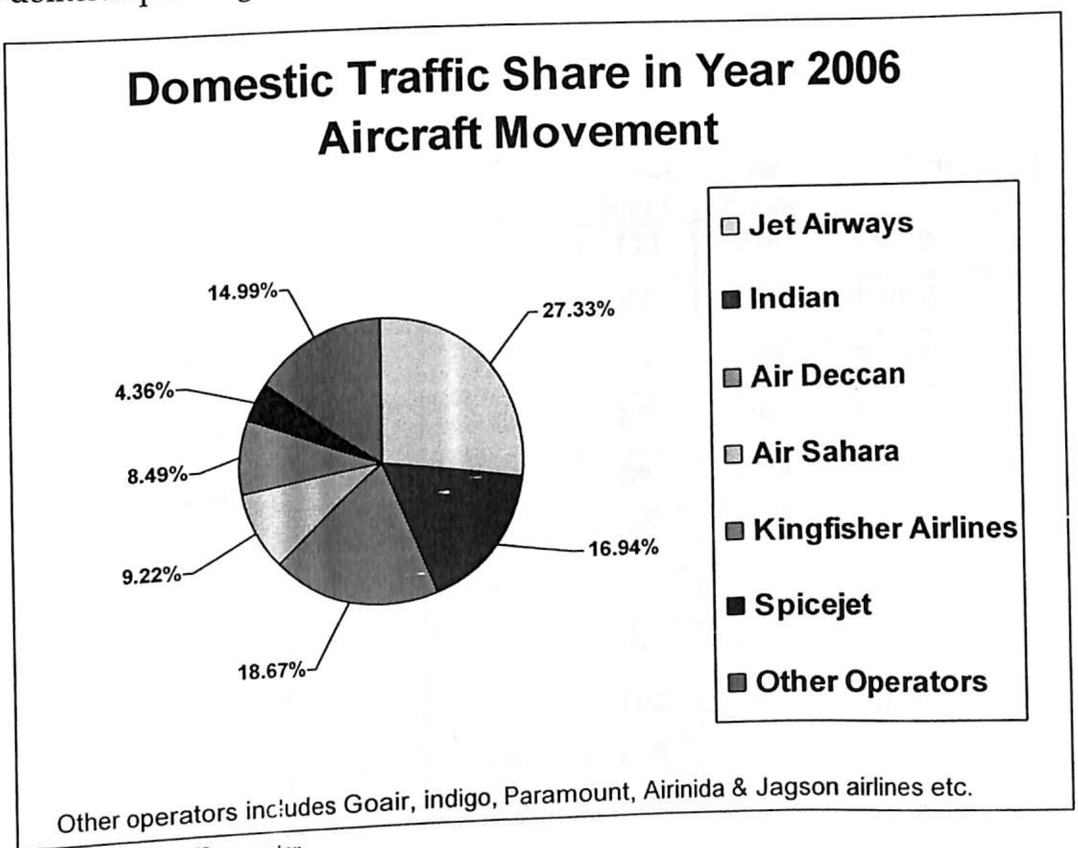


Other operators includes Goair, indigo, Paramount, Airinida & Jagson airlines etc.

Source AAI Traffic reporter

In terms of domestic passenger traffic share Jet Airways is number one with the share of 29.98%, on adding the share of Air Sahara which is 8.72% this share becomes approximately 38%. With the share of 8.24%, the Kingfisher is very close to the Air Sahara which is competing on the basis of "Creating a difference by offering best services".

Among the Low cost carriers only Air Deccan and Spice jet has been able to show their significant presence with the market share of 17.2% and 7.24% respectively. This analysis reveals that there is sufficient scope available for the full service carriers if operated efficiently and effectively and presence of Low cost carrier has not affected much on their market share. It is also evident that even after having the maximum fleet size the PSU airlines i.e. Indian is not able to capture the domestic passenger traffic share proportionately.



Source AAI Traffic reporter

The market share of the domestic traffic in terms of aircraft movement during the year 2006 was maximum for Jet Airways which is accounted for 27.33% of total aircraft movement. By adding together with Air Sahara it becomes approximately 36.5%. The share of Indian was 16.94% whereas for the Air Deccan it was 18.67%. The analysis of the above graph reveals that the aircraft utilization factor of Indian is low in comparison with that of private players. With the minimum turnaround time the Air Deccan has been able for more aircraft movement.

EXPANSION PATH

Existing airlines have embarked on the huge capital expenditure plan in terms of acquisition of new aircrafts. Industry forecast suggest investment up to USD 14 bn in aircraft purchase till 2014. Airbus estimated that India would need 1100 new aircrafts by 2025 of which 935 would be passenger and rest freight at a total investment of USD 105 billion. It is estimated that the fleet size of Indian carriers would increase by almost 200% by 2012. The likely fleet addition in major airlines is tabled as follows:

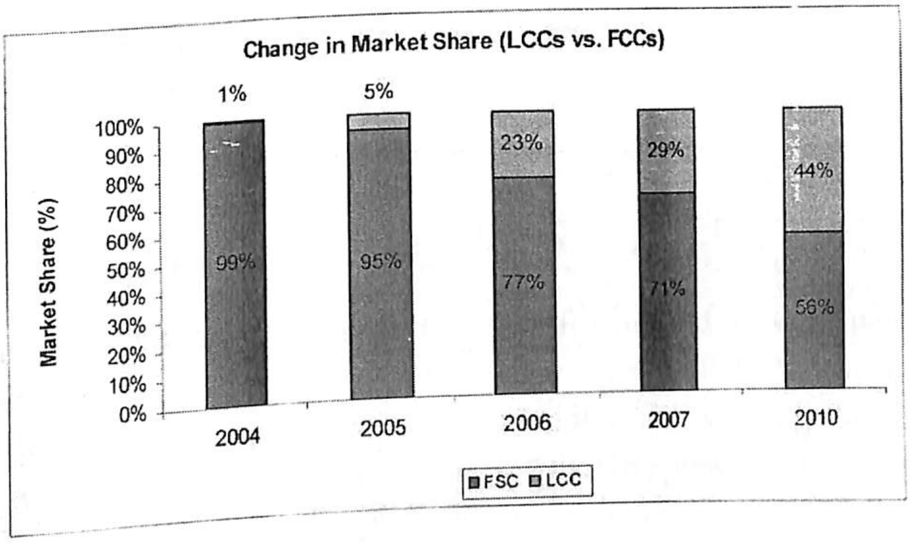
Sr. No.	Airlines	Current Fleet	Fleet Addition	Total Fleet	Time Frame	Type
1	Indian	70	43	113	2010	Airbus
2	Jet Airways	53	30	83	2010	Boeing
3	Air Sahara	29	15	44	2010	Boeing
4	Kingfisher	18	90	108	2011	Airbus/ATR
5	Air Deccan	40	90	130	2014	Airbus/ATR
6	Spice Jet	9	40	49	2010	Boeing
7	Paramount	5	13	18	2010	Embraer
8	Go Air	7	33	40	2012	Airbus
9	Indigo	5	95	100	2012	Airbus
	Total	236	449	685		

 # Source India Infrastructure Research & company press releases

However, it is expected that 20% of these orders would be replacement orders and 20% of the orders may not get materialized. As per above table Air Deccan will have the largest fleet size by 2014. Further fleet expansions are also expected in low cost carriers, such as Indigo, Spice jet, etc

STRUCTURAL CHANGES

The structure of airline industry has undergone a sea change in the last decade wherein the industry has moved from being state run monopoly to an oligopolistic and more recently to a competitive structure. Emergence of low cost carriers (LCC) has changed the industry equation and has made air travel affordable to new customer segment including the common man. Their market share has rising steadily from the time they first began operations in 2003. The change in the market share of Low cost carrier may be seen from the table below:

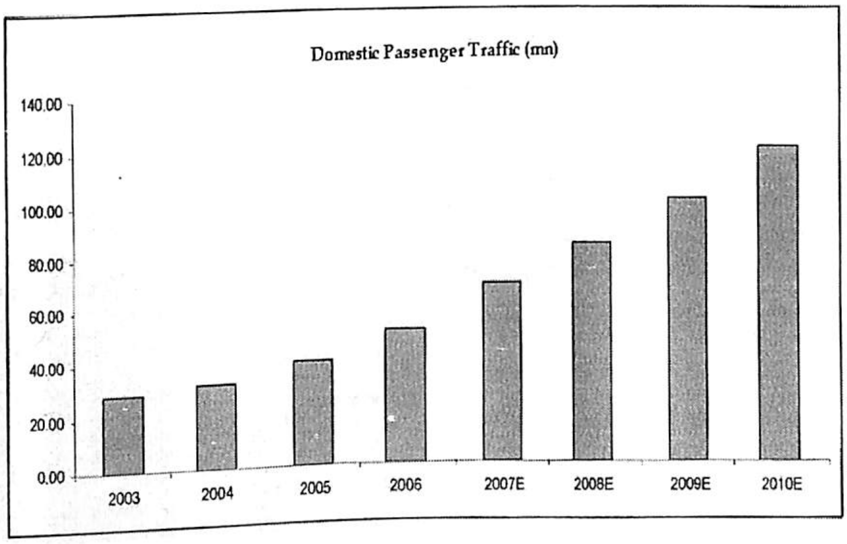


 # Source Ernst & Young Analysis

The graph above shows the shift in market share from Full Service Carriers to Low Cost Carriers. In the year 2004, the total market share of full service carriers was as high as 99% which has declined at 77% in the year 2006 and further expected to go up to 56% in the year 2010. This shows that Low Cost Carriers may capture the bulk of exponential demand growth in India and increase the market share from 29.4% to 44% in the year 2010.

TRAFFIC FORECAST

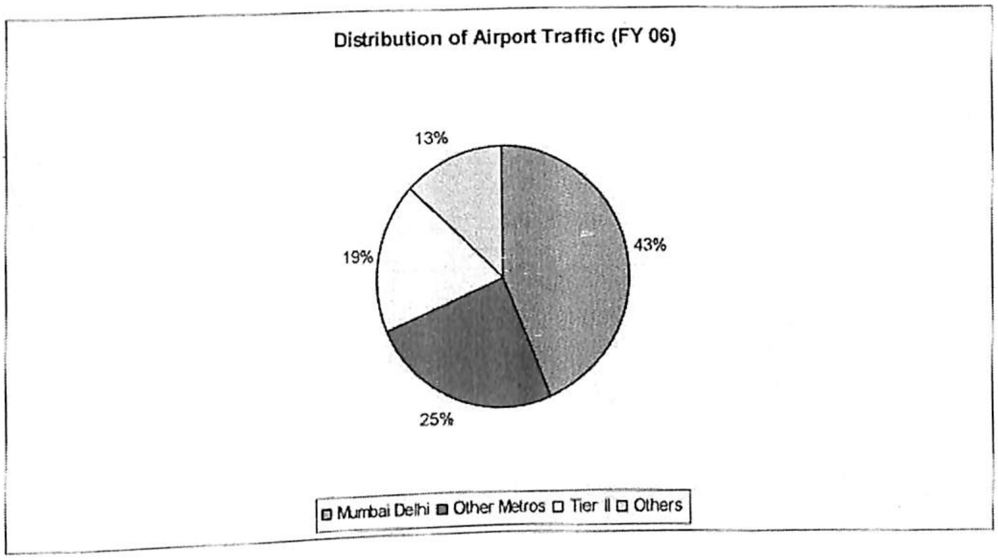
As per the Center for Asia Pacific Aviation (CAPA) estimates the domestic passenger movement across Indian airports are depicted below



 # Source Ernst & Young Analysis

As per Center for Asia Pacific Aviation (CAPA) estimates the domestic passenger movement across Indian airports is likely to grow at a CAGR 20-25% up to 2010. The total domestic passenger traffic (inbound & outbound) at this growth rate is expected to increase to around 120 million by 2010. The above graph shows the past trend of the domestic passenger traffic at all Indian airports starting from year 2003 and the forecast up to the year 2010.

The distribution of the total passenger traffic at various airports in the year 2006 is depicted below:



 # Source: Ernst & Young Report

The above analysis reveals that the Delhi and Mumbai alone accounted for around 43% of total domestic traffic and all four metros put together accounted for around 68% of total passenger traffic in FY 06.

OPERATIONAL AND FINANCIAL PERFORMANCE

Aggressive pricing, falling yields, high ATF costs and inadequate airport infrastructure have resulted in huge losses for airline operators. Industry experts estimate a total cash loss of Rs. 2,000-2500 Crores in the FY 07 for all airlines put together.

The comparison of cost structure of listed domestic civil airlines vis-à-vis an international carrier reveal that fuel cost comprises as much as 30-40% of the total operating cost as compared to 20% for foreign carriers. The detailed cost comparison is presented below:

Cost (Rs./ASKM) FY 06	Spice Jet	Southwest	Jet Airways	British Airways
Salaries & Wages	0.44	0.97	0.43	1.29
Fuel	1.09	.064	1.26	0.90
Maintenance MRO	0.19	0.15	0.23	0.26
Landing Fee	0.19	0.16	0.26	0.63
Aircraft financing	0.6	0.25	0.81	0.58
Other Opex	0.21	0.41	1.07	0.77
Total operating cost	2.72	2.58	4.06	4.43
Total operating cost (ex fuel)	1.63	1.94	2.80	3.53

 # Source : Ernst & Young report

The above analysis clearly shows that Indian carriers have performed favorably in terms of reducing the overall operating costs excluding fuel. However, the higher overall cost is due to the higher incidence of local taxes on ATF and monopoly of PSUs. As a matter of fact, ATF prices in India are 60% higher than average fuel prices worldwide due to high incidence of direct and indirect taxes with sales tax in certain states being as high as 30%.

SUMMARY

The domestic airlines industry may be segmented into 3 broad categories: government owned airlines, private full service carriers and private low cost carriers. With the merger of Jet airways and Air Sahara the main competition will be between Indian and Jet airways. Kingfisher has also started showing its significant presence in the market. Low cost segment has been fully dominated by Air Deccan at present. However, Spicejet is also increasing its market share. As per CAPA 2006 survey, domestic passenger movement in the country is expected to grow at a CAGR of 20-25% till 2010. A major part of the growth is being consumed by Low Cost Carriers and by 2010 the LCC are expected to have the 44% of total market share of passenger movement. The growth in the aviation sector is more in metropolitan cities, with like Delhi and Mumbai is contributing as high as 43% of the total domestic traffic. The cost of ATF is the main contributor to the cost structure.

Chapter 5

Operating Structure of Domestic Airlines

This chapter aims at analyzing the operating costs structure of typical domestic airlines with the objective of making out a case for fuel price risk management. The income statements of two typical domestic airlines, Jet Airways (a full service carrier) and Air Deccan (a low cost carrier), have been analyzed for this purpose, in terms of:

(i) As a percentage of Total Revenue

(ii) As a percentage of Total Cost

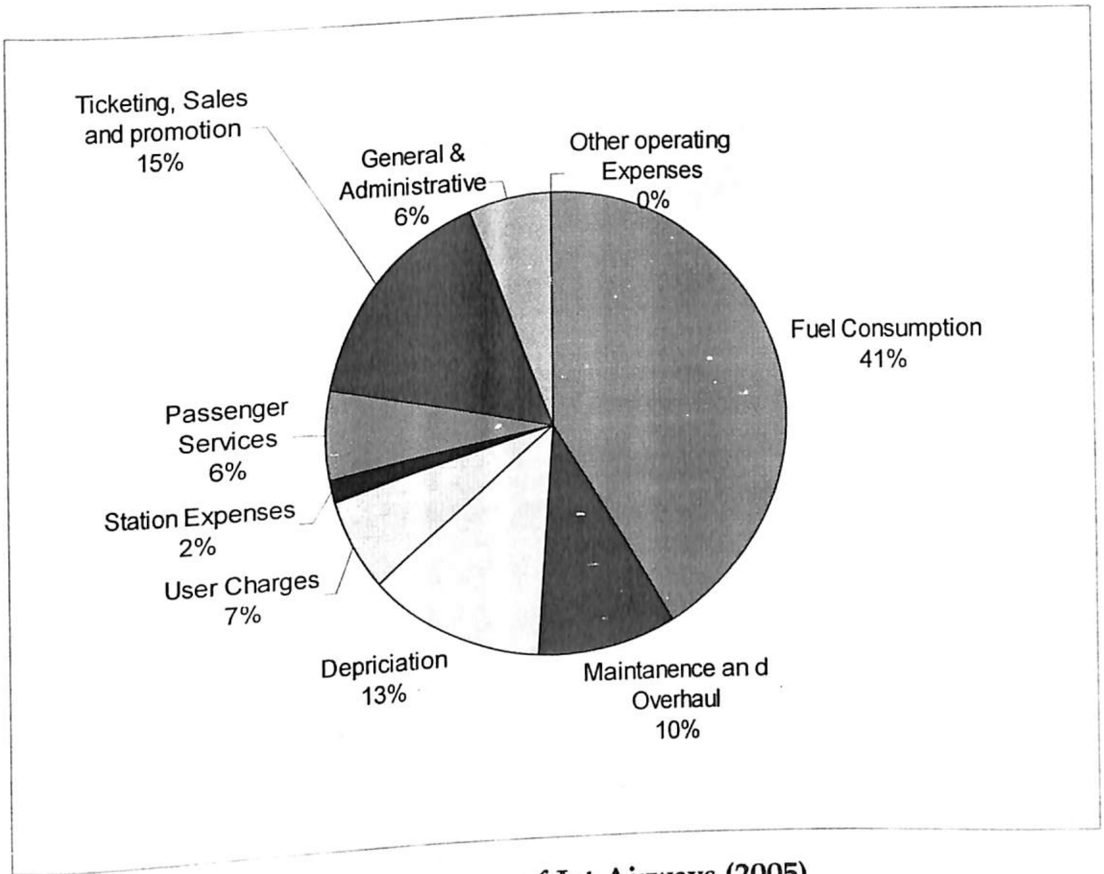


Figure 5.1 Percentage Cost Structure of Jet Airways (2005)

In the pie chart it is clearly shown that fuel consumption have the maximum percentage as compare to total expenses. In case of Jet Airways fuel consumption is about 41% an in case of Air Deccan it has 49% fuel consumption share shown in the figure 5.2

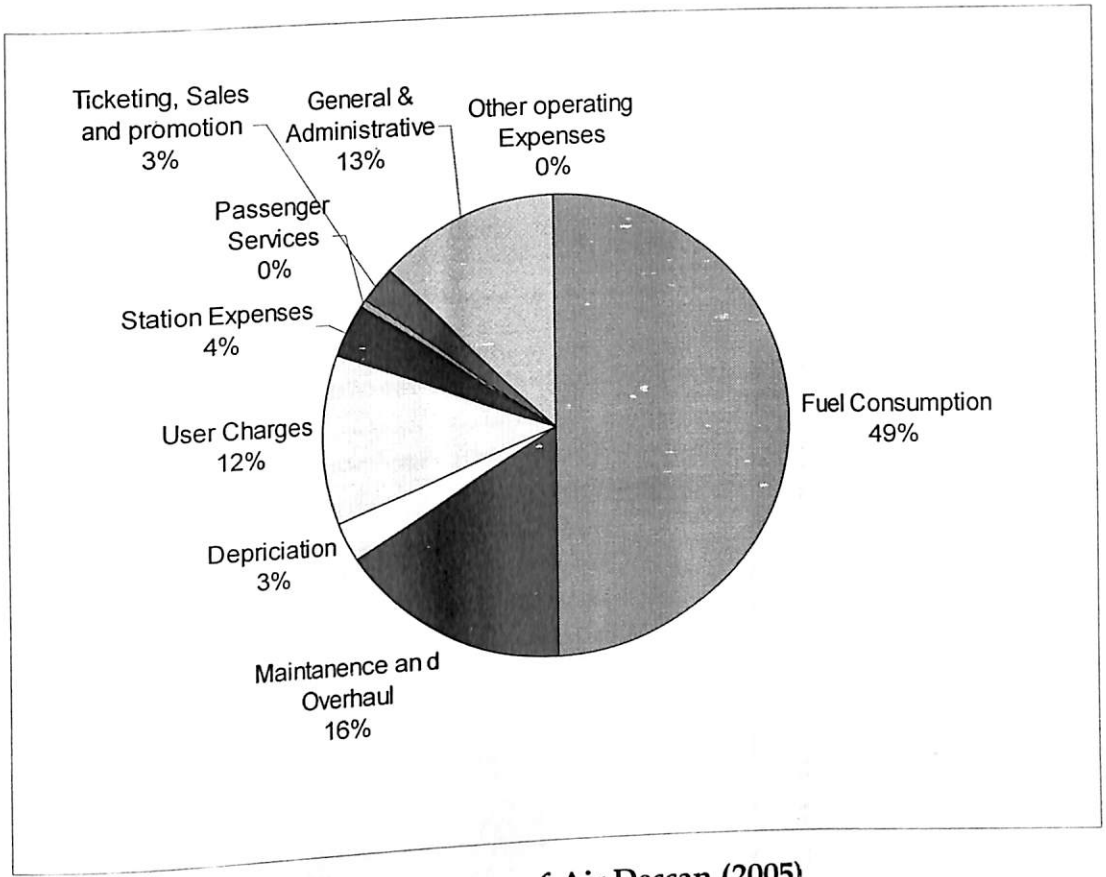


Figure 5.2 Percentage Cost Structure of Air Deccan (2005)

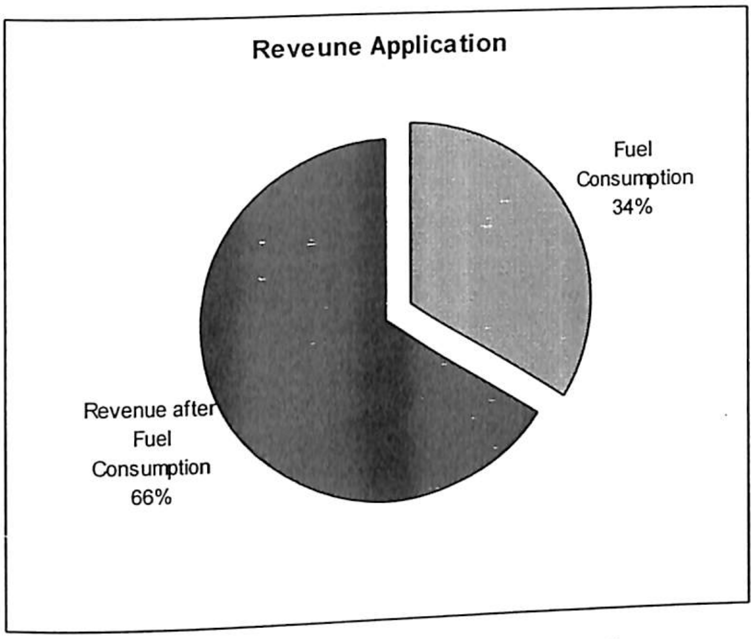


Figure 5.3 Fuel expenditure out of total operating revenue for Jet Airways

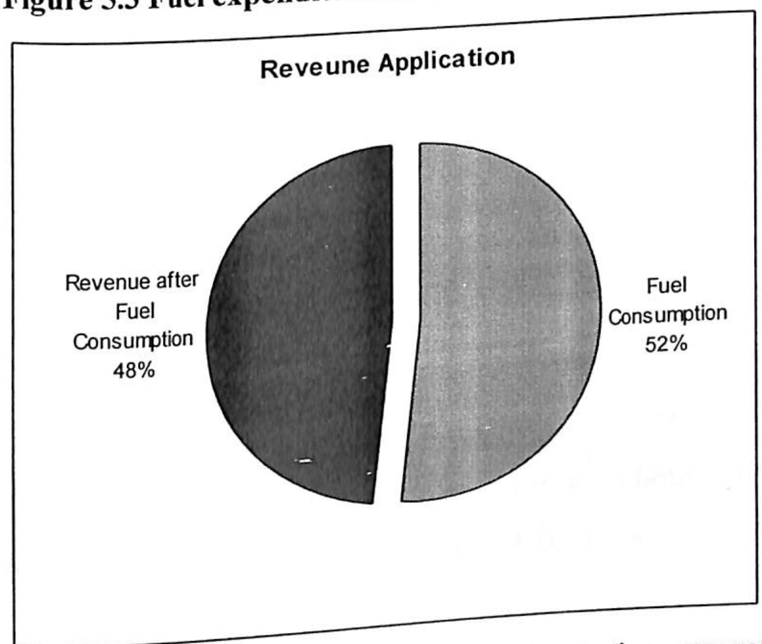


Figure 5.4 Fuel expenditure out of total operating revenue for Air Deccan

Fuel costs comprise a major portion of operating expenses in the Airline industry. For most airlines, it is the second largest expense category behind labor. Thus when oil prices nearly double, as they have between 2004 and 2005, dramatic increases in jet fuel costs can create havoc with an airline's profitability.

Given the extreme volatility of fuel prices, how does an airline hedge its costs and plan for future business operations?

Indian is planning to start hedging its international fuel purchase in the wake of spiraling aviation turbine fuel cost that is eating into its profits. Currently, the annual fuel bill of the airline is around Rs 1,500 crore (Rs 15 billion).

Fuel cost constitutes 35 per cent of an airline's operating cost. Currently, fuel hedging is allowed only for international fuel uplifts. Air India, Indian, Air Sahara and Jet Airways are the domestic carriers operating on international routes.

Air India, which had started fuel hedging, has recently extended its hedging limits from 10 per cent of its international uplifts to 25 per cent. This would, therefore, give flexibility to the airline to hedge up to 75,000 barrels per day, up from the current limit of 30,000 barrels.

Air India's fuel bill in 2005-06 was to the order of Rs 3,134 crore (Rs 31.34 billion), which constituted nearly one-third of its total cost. Following the Reserve Bank of India's approval, Jet Airways has also launched hedging for international fuel uplifts. The government is working out a hedging instrument, which will make domestic carriers to hedge themselves from the increase in jet fuel prices.

Hedging is not by airlines or oil companies. The actual hedging is done by banks. India should have banks, which are capable of undertaking hedging for domestic airlines.

Chapter VI

Aviation Turbine Fuel

In this chapter the detail characteristics of ATF are discussed. Jet propulsion can be traced back to the 1st century B.C. when an Egyptian, Hero, is credited with inventing a toy that used jets of steam to spin a sphere. Sixteen centuries later, Leonardo da Vinci sketched a device that used a flux of hot gas to do mechanical work. By the 17th century, inventors were beginning to develop simple turbine systems to operate machinery.

The development of a turbine engine for aircraft began independently in Germany and Britain in the 1930s. In Germany, Hans von Ohain designed the engine that powered the first jet flight in 1939. Germany deployed the jet-powered Messerschmitt 262 late in World War II.

In Britain, Frank Whittle obtained a patent for a turbine engine in 1930. An aircraft powered by an engine he designed first flew in 1941. The first British jet fighter, the Gloster Meteor, also flew late in World War II.

1. Aviation Turbine Fuel Introduction

Water contained in the sphere is heated and the steam escaping through the jets causes the sphere to turn in the opposite direction.

TYPES OF FUEL

Illuminating kerosene, produced for wick lamps, was used to fuel the first turbine engines. Since the engines were thought to be relatively insensitive to fuel properties, kerosene was chosen mainly because of availability; the war effort required every drop of gasoline.

After World War II, the U.S. Air Force started using "wide-cut" fuel, which, essentially, is a hydrocarbon mixture spanning the gasoline and kerosene boiling ranges. Again, the choice was driven by considerations of availability:
It was assumed that a wide-cut fuel would be available in larger volumes than either gasoline or kerosene alone, especially in time of war. However, compared to a kerosene-type fuel, wide-cut jet fuel was found to have operational disadvantages due to its higher volatility:

- Greater losses due to evaporation at high altitudes.
- Greater risk of fire during handling on the ground.
- Crashes of planes fueled with wide-cut fuel were less survivable.

So, the Air Force started to change back to kerosene-type fuel in the 1970s and has essentially completed the process of converting from wide-cut (JP-4) to kerosene-type (JP-8) system-wide. The U.S. Navy has used a high flashpoint kerosene-type fuel (JP-5) on aircraft carriers because of safety considerations since the early 1950s. See Figure 3.1 for a list of U.S. military jet fuels.

When the commercial jet industry was developing in the 1950s, kerosene-type fuel was chosen as having the best combinations of properties. Wide-cut jet fuel (Jet B) still is used in some parts of Canada and Alaska because it is Hero's Toy 2 suited to cold climates. But kerosene-type fuels - Jet A and Jet A-1 - predominate in the rest of the world.[1] Jet A is used in the United States while most of the rest of the world uses Jet A-1. The important difference between the two fuels is that Jet A-1 has a lower maximum freezing point than Jet A (Jet A: - 40°C, Jet A-1: - 47°C). The lower freezing point makes Jet A-1 more suitable for long international flights, especially on polar routes during the winter. However, the lower freezing point comes at a price. Other variables being constant, a refinery can produce a few percent more Jet A than Jet A-1 because the higher freezing point allows the incorporation of higher boiling components, which in turn, permits the use of a broader distillation cut. The choice of Jet A for use in the United States is driven by concerns about fuel price and availability. Many years of experience have shown that Jet A is suitable for use in the United States, especially for domestic flights.

Aviation Turbine Fuel (AVTUR) or internationally better known as Jet A-1 is fuel for jet or turbo jet type of plane (either full of jet propulsion type or the propeller one). AVTUR is also self produced at PERTAMINA refineries.
Besides providing a source of energy to power the aircraft, fuel is also used as a hydraulic fluid in engine control systems and a coolant for certain fuel system components. There is only one type of jet fuel, kerosene type, in civil use world wide. So it's extremely important to fuel supplier to ensure fuel in high quality and internationally recognized standard accordingly.

The quality check list comprises the most stringent requirements of its specifications. AVTUR/Jet-A1 provided by PERTAMINA Aviation fulfills the standard from British Ministry of Defence, Defence Standard 91-91/latest issue (Turbine Fuel, Aviation Kerosene Type, Jet A-1, and NATO Code F-35), DERD 2494 and ASTM D 1655, the Standard of Specification for Aviation Turbine Fuel.

AVTUR is the fuel from the petroleum fraction designed for the fuel of air transport (Aviation) at the plane which has turbine machine or external Combustion Engine. The performance of AVTUR is especially determined by the characteristic of its hygiene, combustion and its characteristic at low temperature. According to these specification, AVTUR complied the requirements needed such as has a freeze point maximum of -47°C and a flash point minimum of 38°C (100° F).

Specification / Test Requirements

AVTUR (Aviation Turbine Fuel) / Jet A-1
BRITISH MINISTRY OF DEFENCE
DEFENCE STANDARD 91-91/ISSUE 5

Test	Property	Units	Limits	Method
1	**Appearance**			
1.1	Visual Appearance		Clear, bright and visually free from solid matter and undissolved water at ambient temperature	
1.2	Colour		Report	ASTM D 156 or ASTM
1.3	Particulate Contamination, at point of manufacture	Mg/l	Max 1.0	IP423/ASTM D 5452 (see NOTE 2)
2	**Composition**			
2.1	Total Acidity	mg KOH/g	Max 0.015	IP 354/ ASTM D 3242
2.2	Aromatic Hydrocarbon Types			
2.2.1	Aromatics	% v/v	Max 25.0	IP 156/ ASTM D 1319
or				
2.2.2	Total Aromatics	% v/v	Max 26.5	IP 436/ ASTM D 6379 (see NOTE 3)
2.3	Sulphur, Total	% v/v	Max 0.30	IP 336
2.4	Sulphur, Mercapatan	% m/m	Max 0.0030	IP 342/ ASTM D3227 (see NOTE 4)
2.5	Doctor Test		Doctor Negative	IP 30
2.6	Refining Components at point of manufacture			
2.6.1	Hydro processed Components	% v/v	Report	
2.6.2	Severely Hydro processed Components	% v/v	Report	(see NOTE 5)
3	**Volatility**			IP 123/ ASTM D 86 (see NOTE 6)
3.1	Distillation			
3.1.1	Initial Boiling Point	°C	Report	
3.1.2	10% Recovery	°C	Max 205.0	
3.1.3	50% Recovery	°C	Report	
3.1.4	90% Recovery	°C	Report	
3.15	End Point	°C	Max 300.0	
3.1.6	Residue	% v/v	Max 1.5	
3.1.7	Loss	% v/v	Max 1.5	
3.2	Flash Point	°C	Min 38.0	IP 170
3.3	Density at 15 °C	kg/m³	Min 775.0 Max	IP 365/ ASTM D 4052

4 **Fluidity**			
4.1 Freezing Point	°C	Max minus 47.0	IP 16/ ASTM D 2386
4.2 Viscosity at minus 20°C	mm^2/s	Max 8.000	IP 71/ASTM D 445
5 **Combustion**			
5.1 Smoke Point	mm	Min 25.0	IP 57/ASTM D 1322 (see NOTE 7)
or Smoke Point	mm	Min 19.0	IP 57 ASTM D 1322
5.2 And Naphthalenes	% v/v	Max 3.00	ASTM D 1840
5.3 Specific Energy	MJ/Kg	Min 42.80	(see NOTE 8)
6 **Corrosion**			
6.1 Copper Strip	Class	Max 1	IP 154/ ASTM D130 (see NOTE 9)
7 **Thermal Stability JFTOT at Control Temperature of 260 °C**			IP 323 / ASTM D 3241 (see NOTE 10) (See NOTE 11)
7.1 Tube Rating Visual		Less than 3. No Peacock (P) or Abnormal (A)	
7.2 Pressure Diffrential	mm Hg	Max 25	
8 **Contaminants**			
8.1.1 Existent Gum	mg/100 ml	max 7	IP 131/ASTM D 381
or 8.1.2 Existent Gum with Air	mg/100 ml	max 7	IP 131/ASTM D 381 (see NOTE 12)
9 **Water Separation Characteristics**			ASTM D 3948 (See NOTE 13)
9.1 Microseparometer, at Point of Manufacture			
9.1.1 MSEP Without SDA	Rating	Min 85	
9.1.2 MSEP With SDA	Rating	Min 70	
10 **Conductivity**			
10.1 Electrical Conductivity	pS/m	Min 50	IP 274/ASTM D 2624 (See NOTE 14)
11 **Lubricity**			
Wear Scar Diameter	mm	Max 0.85	ASTM D 5001 (see NOTE 15)

Chapter 7

Fuel Price Risk Management Strategies

This chapter documents various strategies of fuel price risk management, including, both, hedging as well as non hedging approaches. Derivative strategies using over-the-counter derivatives, futures contracts etc, are discussed with suitable illustrations. Finally, the outcomes of an industry survey conducted as of December 31, 2006, are presented.

Interestingly, the study points out that, contrary to the opinions of many air line executives, the optimal strategy is to employ a dynamic hedging program that is actively managed through the price cycle using a variety of derivative products. Because the airline industry is relatively unhedged at the present, using derivatives to hedge jet fuel costs creates a competitive advantage and has been shown to increase firm value.

Available Hedging Strategies

Domestic airlines have a variety of hedging strategies available to them. These include using both over-the-counter and exchange-traded derivatives and remaining unhedged.

Over-the-Counter Instruments

Options, including collar structures, and swaps are the primary derivatives used by air lines. Many, including Southwest, have stated that they prefer over-the-counter derivatives to exchange traded futures because they are more customizable. OTC derivatives are traded directly between the airlines and investment banks, and as such have counterparty risk that must be considered. Therefore, most airlines prefer to trade with three or four different banks to diversify this risk and also to get the best pricing possible. The ability to customize these contracts greatly facilitates the implementation of a dynamic hedging strategy, which is successfully used by Southwest, and, to a lesser degree, JetBlue. This strategy is based on the presumption that the oil price cycle is a mean-reverting process, or that it moves in cycles rather than consistently in one direction. Given this characteristic, it is possible to implement a hedging strategy that enables airlines to lock in prices at the low point in the cycle while capping prices at the high end to take advantage of eventual price declines.

Organizations such as British Petroleum (BP) support this strategy and believe that the key is to have a dynamic hedging program, using a variety of products and durations. To implement a dynamic hedging strategy, a firm needs to vary the products over the oil price cycle. When oil is at the low point in the cycle, receive-fixed swaps are used because the likelihood of further price declines is not considered as probable as price increases, and the swap contract allows the airline to lock in the relatively low price. In the mid-range of the cycle, collars are used to lock in a specified range of prices, giving up potential savings from price depreciation while hedging against further increases. When oil prices are at the top of the price cycle, caps are used to prevent losses from further appreciation while allowing the company to take advantage of price decreases.

This sophisticated strategy requires a substantial amount of monitoring, but it has been rather successful for Southwest: their fuel costs are currently locked in at the equivalent of $24 per barrel of oil while the majority of its competition is paying market of approximately $40 per barrel.

Exchange-Traded Futures

Jet fuel futures contracts do not exist in the United States, so futures on crude or heating oil must be used instead to hedge jet fuel purchases. Because these futures contracts are based on an underlying commodity other than jet fuel, they introduce basis risk because they are not perfectly correlated. Basis is generally defined as:

Basis = spot price of hedged item - futures price of selected contract

Basis risk is a result of the relationship between the spot price and futures price not remaining constant throughout the life of the hedge, thus generating ineffectiveness. At the onset of the hedging relationship, the optimal hedge ratio will take into account the current basis, as well as the difference in volatilities of and the correlation between the spot commodity and the futures contract.

In the case of the airline industry, in which they are short jet fuel and must go long futures, the change in value of the hedge over the life of the relationship is given by:

$$\Delta \text{ Jet Fuel Spot Price} - H * \Delta \text{ Futures contract}$$

Where H is the hedge ratio.

The value of H will determine the number of futures contracts to enter. It is calculated as follows:

$H = \rho * \sigma\,[spot] / \sigma\,[futures]$

Where:

ρ: the correlation between the spot jet fuel price and selected futures contract

σ: the standard deviation, or volatility, of each respective contract

H can also be calculated by running a regression with the hedged commodity as the dependent variable and the derivative as the independent variable. The coefficient of the independent variable will give the same value for H as the calculation above. For example, it was calculated that as of December 31, 2003, the correlation between New York Harbor jet fuel and the NYMEX 30-day Crude Oil Futures contracts was 93.71%. To illustrate with a numerical example, historical data has been used to setup hedging strategies using heating oil and crude oil futures contracts. Weekly price data for jet fuel, crude oil futures, and heating oil futures have been obtained. It has been assumed that on January 1, 2004 and the airline is trying to determine how many and what types of contracts to purchase. H value has been calculated for both crude and heating oil 90-day futures. The calculations have been performed twice: first using one year of historical data and then using two years of data, in an effort to observe how the ratios change based on the estimation technique used. It was found that the calculated values for H did vary depending on the amount of historical data that was used. Thus, in practice, it is necessary to exercise considerable judgment when performing such a calculation. These hedges must be continually monitored to ensure the basis is still relatively the same as when the hedge was initiated.

Hedge Ratio Calculation

Hedge Ratio Correlation	Regression Coefficient (H)	Correlation of Returns with Jet Fuel	Volatility of Returns	Calculated H
1 year of historical data				
je fuel	n/a	n/a	54.85%	n/a
crude oil	1.06	77.00%	39.75%	1.06
heating oil	1.15	90.35%	43.22%	1.15
2 years of historical data				
Jet Fuel	n/a	n/a	44.91%	n/a
Crude Oil	0.98	80.41%	36.73%	0.98
Heating Oil	1.07	91.18	38.33%	1.07

Source: Historical commodity prices from DataStream and U.S. Energy Information Administration

Application

An airline has based its jet fuel purchasing budget on a maximum price of $ 190/tonne for the winter period. The current price for jet kerosene CIF NW Europe is $ 170/tonne. The purchasing department has decided not to lock in a price at the current market level because they feel that the prices may fall further to around $ 150/tonne. To protect themselves against a price move $ 190, the purchasing department could buy $ 190/tonne call option at a cost of $ 1/tonne.

Example:

Buy a $ 190/tonne put option	$ 1/tonne
Net cost of transaction	$ 1/tonne

The result of this strategy is to limit the upside price risk so that the maximum price paid by the airline for its jet fuel would be $ 190/tonne.

If price remain below $ 190/tonne, the $ 190/tonne call option will not be exercised and the purchasing department can meet its budget target with direct purchases on the spot market.

If the prices rise above $ 190/tonne call option will be exercised and the airlines can its supplies from the option writer at $ 190/tonne, however high spot market prices go.

Zero cost collar strategy:

If the airline purchasing department thinks that the $ 1/tonne premium is too expensive, they could consider selling put option. Selling a $ 150/tonne put option would generate a premium of $ 1/tonne that exactly offsets the cost of buying the $ 190/tonne call option.

Example:

Buy a $ 190/tonne call option	- $ 1/tonne
Sell a $ 150/tonne put option:	+ $ 1/tonne
Net cost of transaction:	$ 0.0/tonne

The result of this strategy is to limit the upside and downside price risks to a range between $ 190/tonne and $ 150/tonne.

If prices rise above $ 190/tonne, the call option will be exercised giving the purchasing department the right to buy its supply at a maximum price of $ 190/tonne, however high prices go.

If prices fall below $ 150/tonne, the $ 150/tonne put option will be exercised and the purchasing department will be obliged to sell jet fuel at $ 150/tonne, however low prices go. However the airline can also buy its jet fuel at the lower market price, the net purchase price remains fixed at a minimum of $ 150/tonne.

Both strategies are widely used by the airlines and the strike price can be set at any level.

Not Hedging

By not hedging, airlines are taking on the risk of rising commodity prices into their business model. Some airline executives claim that this risk is present regardless of whether they hedge or not. Airline executives often comment that hedging is not a core competency, and that [according to the airline executives] as long as competitors are not hedged, it will be a level playing field. When fuel prices rise dramatically; airlines cannot pass all of the cost on to their customers. Other fuel-dependant companies, such as FedEx, are able to force their customers to accept fuel surcharges, however, in the airline industry the success of such programs is very unpredictable (specific examples are discussed later in the paper). A study from the Wharton School of Business notes that the current spike in jet fuel prices will add an extra $2.5 billion in additional expenses, according to the Air Transport Association. In response, several companies tried to attach a fuel surcharge, but with continued weak demand and fierce competition, the increases didn't stick.

Chapter 8 International Experience of Fuel Price Risk Management

Internationally, competitive airlines use fuel price risk management techniques to cover a significant portion of their total purchases. Airlines like Southwest, Delta, and JetBlue Airways hedge up to 90%, 60% and 65% respectively. Industry analyst has different views. Some are in favor of the hedging and some of them are against the hedging.

Making the case against hedging, Rod Eddington, the CEO of British Airways, commented: a lot is said about hedging strategy, most of it is well wide o f the mark. I don't think any sensible air line believes that by hedging it saves on its fuel bills. You just flatten out the bumps and remove the spikes. Hedge all you do is bet against the experts of the oil market and pays the middle man, so you can't." He went on to say that there is a case for not doing any hedging at all. – When you hedge all you do is bet against the experts of the oil market and pay the middle man, so you can't save yourself any money long term. You can run fro m high fuel prices briefly thro ugh hedging but you can't run for long.

The notion that remaining exposed to fuel prices is the norm of the air line industry and before acceptable is questionable at best. John Armbrust, a jet fuel contract consultant, talking about the majority o f the airline industry, other than Southwest and JetBlue, states –don't underestimate the ability of the air lines to walk off a cliff together. Almost all of them are pretty vulnerable right now. This herd mentality exists primarily among the full-service traditional air lines. The low-cost carriers such as Southwest and JetBlue have clearly departed from this line of thinking, and by doing so have achieved financial success while the rest of the industry is on the verge of bankruptcy.

The true state of the industry is not one in which any air lines are hedged, but rather, the airlines that are hedged have a competitive advantage over the non-hedging air lines. Empirical evidence does no t support the assertion of these air line executives that a hedging strategy is not valuable. The independent variables in their regression include the following: 1) change in value of a market portfolio, 2) the percentage change in jet fuel prices, 3) a dummy variable set to one if the company discloses use of derivatives to hedge jet fuel, 4) a dummy variable set to one if the company has disclosed it is currently hedging, 5) the percentage the company has hedged o f its fuel purchases for the next year6) size o f the air line, 7) whether the air line pays dividends, 8) degree o f leverage, 9) profitability, 10) Investment opportunities, and 11) a dummy variable for each year in the study.

This turned out to be between 12-16% and was statistically significant, which is very supportive o f the notion that hedging helps to create value for a firm. The hedging premium can be attributed to the benefits an airline reaps by generating mo consistent, stable cash flows. Hedging air lines are able to better predict future cash flows and earnings and make investments during the high stages of the price cycle, both of which are positively valued by investors.

First, by locking in cash flows airlines are better able to reduce their most volatile expense category, thus reducing the volatility of their earnings. In general, the financial markets do not trust airlines earnings consistency and, therefore, heavily discount the sector's stock. Airline P/E ratios are generally half or a third o f the market average, a fact often lamented by airline CEO's. By hedging jet fuel purchases, air lines are better able to predict future expenses and earnings, which would help increase the confidence of the financial markets. Secondly, hedging allows airlines to take advantage of investment opportunities in times of high commodity prices. .

This is explained by the significant distress costs in the industry. It is more likely that airlines will go bankrupt when fuel pr ices very high, and in such cases they are often forced to sell p lanes and other assets at substantially below-market prices. For example, start-ups National Air lines and Legend Air lines filed bankruptcy protection in December of 2000, cited rising fuel costs as a significant factor of insolvency, and were forced to liquidate assets at bargain prices. Airlines that are hedged against higher prices will have more resources available to invest and are therefore the only ones able to purchase these discounted assets, thus strengthening their competitive position and growing value through relatively mo re positive NPV investment opportunities than their competition.

Jet fuel represents a critical expense category for any airline that bears its own fuel costs and each of the air lines included this analysis bears at least 80% of its fuel costs. In fact, fuel has consistently been one o f the largest expense categories for domestic airlines, ranking second only to personnel expenses. During 2003 fuel costs represented, o n average, over 16% of the total operating expenses for the 13 domestic air lines included in this analysis. Moreover, airlines are generally unable to increase fares to offset any significant increase in fuel costs.

From 2001 to 2003, the same airlines experienced a 25.9% compound annual increase in jet fuel costs (as measured by U.S. Gulf Coast jet fuel spot prices) while average air line pr icing decreased by 0.1% (as measured by revenue per available seat mile). In addition, from February to May 2004 several air lines tried to increase fares and surcharges by $5-10 to offset increased fuel costs. However, competitors have not responded with similar increases and, thus far, each attempt has failed.

In addition to the obvious importance of controlling such a significant operating expense for an airline, measurable fuel hedging can increase the value of the firm. While there are a number of factors that influence an airline's valuation, as of December 2003 the valuations of the airlines (as measured by the fir m's price to revenue ratio) included in this analysis do have a positive correlation coefficient with the airline's level of fuel hedging. It was accordingly decided to use the price/revenue ratio rather than price to earnings because many of the airlines have negative earnings.

The impact of rising fuel costs o n the profitability of hedged and unhedged air lines is readily apparent, especially since 2004. As the spot price for crude oil reached $37 per barrel in March 2004 and averaged $34 per barrel year-to-date, industry analysts began revising earnings estimates for the airline segment. At the time, both Morgan Stanley's airline analyst and economist believed the increase in crude prices would lead to an average spot price for crude oil of $34 per barrel for all of 2004.

As a result, earnings estimates based on a $30 per barrel spot price were revised downward for airlines with unhedged fuel. EPS estimates of airlines with unhedged fuel costs (American, Continental, and Northwest) due to the change in crude prices. As fuel prices have continued to escalate beyond the assumptions in these 2004 EPS estimates, industry analysts have questioned how many o f the major airlines with unhedged fuel will be able to avoid bankruptcy in the near term.

The variety and effectiveness of hedging strategies employed by airlines is also evident in their actual jet fuel costs per gallon. During 2003, the largest fuel hedgers (Southwest, JetBlue, and Delta) achieved actual fuel costs that were in- line or below the average New York and U.S. Gulf jet fuel spot prices for the year; whereas, those airlines that do not have a track record of effectively hedging fuel costs incurred actual fuel costs that were at or above the aver age spot price for the year.

With 82% and 40% o f their expected 2004 fuel consumption hedged as o f December 2003, both air lines have stated that fuel hedging is a key component o f their lo w-cost strategy and believe this strategy represents a competitive advantage. In 2001-2003, Southwest reduced its annual fuel expense by $171 million, $45 million, and $80 million, respectively, thro ugh its fuel hedging operations. The company reports that liquidity for jet fuel contracts is limited, and as such, it uses heating and crude oil futures contracts and over-the-counter derivatives to hedge its jet fuel consumption.

As of December 2003, Southwest had a mixture o f purchased call options, collar structures, and fixed price swap agreements in place to hedge portions of its expected 2004-2007 jet fuel consumption. This dynamic hedging strategy was discussed in detail in the Over-the-Counter section of this paper. Like Southwest, JetBlue experienced material reductions in its fu el expenses in 2003-2003 through its hedging strategy, reducing annual fuel costs by $4 million and $1 million, respectively.

JetBlue did not hedge any of its fuel cost in 2001. The companies outsource all of its fuel management services to a third-party and hedges its jet fuel needs through crude oil option contracts and swap agreements. JetBlue also diversifies its counterparty risk by using three or four primary counterparties with investment grade credit ratings. At the other end of jet fuel hedging spectrum, several major air lines have hedged only a small portion or none of their expected 2004 fuel consumption, including American, Continental, Northwest, and United.

Ironically, these are the air lines that cannot afford the increasing fuel costs due to severe cash flow constraints. Similar to JetBlue and Southwest, these airlines have historically hedged their jet fuel costs using heating oil and crude options, swaps, and futures. However, over the past three years, these airlines have had limited fuel hedging operations because they are unable to generate cash flows to finance futures margin deposits or option premiums. In fact, Delta entered 2004 with fuel hedges in place but was forced to close the positions to generate cash for operations. In addition, United had its fuel hedges canceled by its counterparty due to bankruptcy filing.

Derivatives and Other Financial Instruments our results of operations can be significantly impacted by changes in the price and availability of aircraft fuel. Aircraft fuel expense for the years ended 2003, 2002 and 2001 represented approximately 21.5 percent, 22.0 percent and 21.2 percent of our operating expenses, respectively. Our efforts to reduce our exposure to increases in the price and availability of aviation fuel include the utilization of fixed-price fuel contracts and fuel cap contracts.

Fixed-price fuel contracts consist of an agreement to purchase defined quantities of aviation fuel from a third party at defined prices. Fuel cap contracts consist of an agreement to purchase defined quantities of aviation fuel from a third party at a price not to exceed a defined price, limiting our exposure to upside market risk.

As of December 31, 2003, utilizing fixed-price fuel contracts we agreed to purchase approximately 29 percent and 12 percent of our anticipated fuel needs through December 2004 and 2005, respectively at a price no higher than $0.75 per gallon of aviation fuel for 2004 and 2005, including delivery to our operations hub in Atlanta and other locations.

During the first quarter of 2004, we entered into an additional fixed-price fuel contract and a fuel cap contract. These new contracts increased our total future fuel purchase commitments to approximately 35 percent of our estimated fuel needs during 2004 at a price no higher than $0.77 per gallon of aviation fuel. During 2003 and 2002, our fixed-price fuel contracts and fuel cap contracts reduced our fuel expense by $7.4 million and $4.7 million, respectively.

During 2001, we used swap agreements to hedge our fuel requirements. We have accounted for our derivative instruments used to hedge fuel costs as cash flow hedges in accordance with SFAS 133. Therefore, all changes in fair value that are considered to be effective are recorded in "Accumulated other comprehensive loss" until the underlying aircraft fuel is consumed. During 2003, 2002 and 2001, we recognized losses of $0.5 million, $6.0 million and $2.5 million, respectively, representing the effective portion of our hedging activities. These losses are included in "Aircraft fuel" in the consolidated statement of operations. We recognized gains of approximately $5.9 million and $2.2

Million during 2002 and 2001, respectively, representing the ineffectiveness of our hedging relationships. This gain is recorded in "SFAS 133 adjustment" in our consolidated statements of operations.

On November 28, 2001, the credit rating of the counterparty to all of our fuel-related hedges was downgraded and the counterparty declared bankruptcy on

December 2, 2001. Due to the deterioration of the counterparty's creditworthiness, we no longer considered the financial contracts with the counterparty to be highly effective in offsetting our risk related to changing fuel prices because of the consideration of the possibility that the counterparty would default by failing to make contractually required payments as scheduled in the derivative instrument. As a result, on November 28, 2001, hedge accounting treatment was discontinued prospectively for our derivative contracts with this counterparty in accordance with SFAS 133. Gains and losses previously deferred in "Accumulated other comprehensive loss" continue to be reclassified to earnings as the hedged item affects earnings. Beginning on November 28, 2001, changes in fair value of the derivative instruments were marked to market through earnings. This resulted in a charge (credit) of ($5.8) million and $0.2 million during 2002 and 2001, respectively, which is included in the amount presented as "SFAS 133 adjustment" in our consolidated statements of operations. In March 2002, we terminated all our derivative agreements with the counterparty. The fair market value of the derivative liability on the termination date was approximately $0.5 million. Since this was an early termination of our derivative contracts, losses of $6.8 million at December 31, 2001, deferred in other comprehensive loss will be reclassified to earnings as the related fuel is used through September 2004. During 2003 and 2002, we recognized approximately $0.5 million and $6.0 million, respectively, of the losses deferred in other comprehensive loss. Approximately $0.3 million in net unrealized losses are expected to be realized in earnings during 2004. Upon the adoption of SFAS 133 on January 1, 2001, we recorded unrealized fuel hedge gains of $1.3 million, of which $1.2 million was realized in earnings during 2001.

Fuel Price Risk Management

American Airlines enters into jet fuel, heating oil and crude oil swap and option contracts to dampen the impact of the volatility in jet fuel prices. These instruments generally have maturities of up to 24 months. The Company accounts for its fuel swap and option contracts as cash flow hedges and records the fair value of its fuel hedging contracts in other current assets, other assets and accumulated other comprehensive loss on the accompanying consolidated balance sheets. The Company determines the ineffective portion of its fuel hedge contracts by comparing the cumulative change in the total value of the fuel hedge contract, or group of fuel hedge contracts, to the cumulative change in the forecasted value of the jet fuel being hedged. If the total cumulative change in value of the fuel hedge contract more than offsets the total cumulative change in the forecasted value of the jet fuel being hedged, the difference is considered ineffective and is immediately recognized as a component of Aircraft fuel expense. Effective gains or losses on fuel hedging contracts are deferred in Accumulated other comprehensive loss and are recognized in earnings as a component of Aircraft fuel expense when the underlying jet fuel being hedged is used.

The Company monitors the commodities used in its fuel hedging programs to determine that these commodities are expected to be "highly effective" in offsetting changes in its forecasted jet fuel prices. In doing so, the Company uses a regression model to determine the correlation of the percentage change in prices of the commodities used to hedge jet fuel (i.e., WTI Crude oil and NYMEX Heating oil) to the percentage change in prices of jet fuel over a 12 to 24 month period. The fuel hedge contracts are deemed to be "highly effective" if this correlation is within 80 percent to 125 percent.

Beginning in March 2003, because of the Company's then existing financial condition, the Company stopped entering into new hedge contracts and, in June 2003, terminated substantially all of its contracts with maturities beyond March 2004. The termination of these contracts resulted in the collection of approximately $41 million in settlement of the contracts. The gain on these contracts will continue to be deferred in Accumulated other comprehensive loss and recognized in earnings when the original underlying jet fuel hedged is used. Commencing in October 2003, the Company began to enter into new option contracts with maturities beyond March 2004 for a portion of its future fuel requirements. For the years ended December 31, 2003, 2002 and 2001, the Company recognized net gains of approximately $149 million, $4 million and $29 million, respectively, as a component of fuel expense on the accompanying consolidated statements of operations related to its fuel hedging agreements. The net gains recognized in 2003, 2002 and 2001 included approximately $1 million, $13 million and $72 million, respectively, of expense related to ineffectiveness. The fair value of the Company's fuel hedging agreements at December 31, 2003 and 2002, representing the amount the Company would receive to terminate the agreements, totaled $54 million and $212 million respectively.

Conclusion

By doing study the international market it can be concluded that hedging can be a tool in order to protect from high ATF prices. For many airlines, the answer is that they hedge fuel costs with one or more financial derivatives. The most popular hedge instruments include futures, forward and swap contracts. We consider each derivative and briefly describe how they work. It is straightly cleared by the study of southwest, JetBlue and Delta which hedges up to 80% of their total volume of fuel consumption, it protect the bottom-line of the airlines. Presently the hedging is allowed for international uplift flights, in this project the study reveal that's the hedging should also be allowed for domestic uplifts. The important thing that airlines should take care of is the strategies used in order to hedge commodity risk. An eagle eye is to be there what is happening in the market. The strategy the airlines prepare should be such that it results in economic benefit. The airlines must be allowed to freely purchase the ATF from the open market. It must be allowed to have its own storage and handling facilities. An effective hedging strategy must consider a number of risk management issues. First, the airlines must decide how much of its projected fuel usage it wishes to hedge. At one extreme, the airlines purchases enough futures contracts to hedge 100% of anticipated fuel consumption, and at the other extreme, the airlines chooses to speculate that energy prices will fall and therefore does no hedging. A second consideration is how oil futures prices move relative to jet fuel costs. Since no jet fuel futures contract exists, the airlines must enter into what is known as a cross commodity hedge and determine the appropriate hedge ratio based on relative price movements. Finally, airlines must decide if it really wants to take delivery of the purchased oil. Since this is a cross commodity hedge, the airlines has no productive use for barrels of oil directly and would likely choose to take an offsetting position (i.e., sell the oil futures) just before contract expiration.