Jet Fuel Hedging Strategies: Options Available for Airlines and a Survey of Industry Practices

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Jet fuel costs have substantially risen over the past several years putting consistent pressure on airlines to maintain positive cash flows. While the costs are hedgable, there is not a perfect hedge available in either the over-the-counter or exchange traded derivatives markets. Over-the-counter derivatives on jet fuel are very illiquid which makes them rather expensive and not available in quantities sufficient to hedge all of an airline's jet fuel consumption. Exchange-traded derivatives are not available in the United States for jet fuel, so airlines must use futures contracts on commodities that are highly correlated with jet fuel, such as crude and heating oil. As such, airlines employ a variety of strategies ranging from not hedging to fully hedging using a combination of products.

This paper is divided into several sections. First, we document the various strategies, including hedging using over-the-counter derivatives, futures contracts, and not hedging, and evaluate the effectiveness and merits of each. We then discuss the accounting rules and the implications these rules have for driving hedging strategies. Finally, we perform an industry survey as of December 31, 2003 and document the practices currently in place in the domestic airline industry to determine whether the use of a hedging strategy appears to create market value. Our research indicates that, contrary to the opinions of many airline 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.

I. 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 airlines. Many, including Southwest, have stated that they prefer over-the-counter derivatives to exchange traded futures because they are more customizable.[1] 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. Cynthia Kase, president of Kase & Co. comments that "oil and gas forward curves exhibit consistent mean reversion characteristics, which, along with cyclicality, can be understood well enough in inform a hedging approach."[2] 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. Kay Jones, of BP, further supports this strategy and comments that "the key is to have a dynamic hedging program."[3] Jones advocates 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

[1] Southwest Presentation (2003)
[2] DerivativesStrategy.com (1997)
[3] Jones (2003)

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.[4]

Exchange-Traded Futures

Jet fuel futures contracts do not exist in the United States[5], so futures on crude or heating oil must be used instead to hedge jet fuel purchases.[6] 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:

[4] Southwest Presentation (2003)

[5] There is a futures contract on kerosene that trades on the Tokyo Commodities Exchange (TOCOM). Kerosene is the primary component of jet fuel and is very highly correlated with it. However, these yen-denominated contracts introduce foreign exchange risk which makes them impractical for American companies to use. However, for airlines in other parts of the world, especially emerging markets, this contract is one of the best options for hedging fuel purchases.

[6] The strategy for setting up such a hedge was adapted from McDonald (2003) and Hull (2000).

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

where H is the hedge ratio.

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

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

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, we 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%. See Appendix 1 for correlations between jet fuel and other energy and foreign exchange commodities.

To illustrate with a numerical example, we have used historical data to setup hedging strategies using heating oil and crude oil futures contracts. We have obtained weekly price data for jet fuel, crude oil futures, and heating oil futures. We have assumed it January 1, 2004 and the airline is trying to determine how many of what contract to purchase. We have calculated H for both crude and heating oil 90-day futures, as shown in Exhibit 1. We performed the calculations 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. We 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.

EXHIBIT 1
Hedge Ratio Calculation

1 year of historical data	Regression Coefficient (H)	Correlation of Returns with Jet Fuel	Volatility of Returns	Calculated H
Jet 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%	36.78%	0.98
Heating Oil	1.07	91.18%	38.33%	1.07

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

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. Zea reports that "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." However, Zea further states that "unfortunately, when fuel prices rise dramatically, airlines cannot pass all of the cost on to their customers." [7] 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.

[7] Zea (2002)

In response, several companies tried to attach a fuel surcharge, but with continued weak demand and fierce competition, the increases didn't stick."[8]

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 of the mark. I don't think any sensible airline believes that by hedging it saves on its fuel bills. You just flatten out the bumps and remove the spikes." 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 from high fuel prices briefly through hedging but you can't run for very long."[9]

The notion that remaining exposed to fuel prices is the norm of the airline industry and therefore acceptable is questionable at best. John Armbrust, a jet fuel contract consultant, talking about the majority of the airline industry, other than Southwest and JetBlue, states "don't underestimate the ability of the airlines to walk off a cliff together. Almost all of them are pretty vulnerable right now."[10] This herd mentality exists primarily among the full-service traditional airlines. 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 no airlines are hedged, but rather, the airlines that are hedged have a competitive advantage over the non-hedging airlines.

Empirical evidence does not support the assertion of these airline executives that a hedging strategy is not valuable. In fact, Carter et. al. have shown using regression analysis that there is a "hedging premium" for stocks of airlines using derivatives to hedge jet fuel price exposure.[11] Their

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[8] Wharton School of Business (2004)
[9] AFX News article, *BA says fuel requirement 45% hedging in current year*, May 17, 2004
[10] Levin (2004)
[11] Carter, et. al (2002)

analysis measures the premium by the impact to Tobin's Q[12] which measures relative firm value by taking the ratio of the value of a firm to the net replacement costs of firm assets. 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 any 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 of its fuel purchases for the next year, 6) size of the airline, 7) whether the airline pays dividends, 8) degree of leverage, 9) profitability, 10) investment opportunities,[13] and 11) a dummy variable for each year in the study. The regression used the natural logarithm of Tobin's Q because it enabled the coefficients of the hedging dummy variables to be interpreted as the hedging premium. This turned out to be between 12-16% and was statistically significant, which is very supportive of 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 more consistent, stable cash flows. Hedging airlines 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. Zea reports that "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 of the market average, a fact often lamented by

[12] Carter et. al. (2002) estimate Tobin's Q as follows: (Market value of equity + liquidation value of preferred stock + book values of long-term debt and current liabilities – current assets + book value of inventory) / book value of total assets

[13] The amount of investment opportunities is evaluated by the ratio of capital expenditures / sales

airline CEO's."[14] By hedging jet fuel purchases, airlines 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. Carter et. al. demonstrate that airline investment opportunities are positively correlated with periods of high jet fuel prices. This is explained by the significant distress costs in the industry. It is more likely that airlines will go bankrupt when fuel prices are very high, and in such cases they are often forced to sell planes and other assets at substantially below-market prices. For example, start-ups National Airlines and Legend Airlines both filed for bankruptcy protection in December of 2000, cited rising fuel costs as a significant factor of their insolvency, and were forced to liquidate assets at bargain prices.[15] 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 more positive NPV investment opportunities than their competition.

Frank Shea, CFO of World Fuel Services Corp., further counters the airline executives points, explaining that the airline industry the industry has traditionally attracted CEO's that like to take risks, such as bet that jet fuel will drop in price. "If you look at [some airlines'] financial statements it looks like the grin of an old-school hockey goalie – there are big black gaps in it. How many teeth got swallowed by hockey goalies before they started to wear a mask? What does it take to get people to protect themselves?"[16] Essentially Shea is making the point that airline executives should have learned by now that the evidence points towards the importance of employing a robust hedging program, however, the industry seems to have not yet learned this important lesson.

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[14] Zea (2002)
[15] Trottman (2001)
[16] Reflector.com article, *Southwest Air Hedges Bet on Oil Prices,* May 7, 2004

II. Accounting

The accounting for jet fuel hedges is worthy of discussion because it cannot be kept in a vacuum away from the derivative traders. It is essential that trades are structured and tested in a way that will enable the firm to receive the preferable accounting treatment, otherwise earnings volatility will be increased rather than decreased. Trading desks play a crucial role in ensuring that both the internal and external accountants have the information they need, so an intimate knowledge of the relevant accounting standards is necessary by all parties involved.

Jet fuel consumers are short jet fuel and must purchase the commodity in the future as it is needed for consumption. This type of hedging strategy is defined as a "cash flow hedge of a forecasted transaction" by the Statement of Financial Accounting Standards Number 133.[17] The accounting guidance for such a transaction specifies that the derivative must be marked-to-market on the balance sheet. The offsetting journal entry, however, is not booked to earnings but rather to Other Comprehensive Income ("OCI"). Entries to the OCI account are booked directly to Retained Earnings, bypassing the income statement. Then, when the forecasted transaction impacts the income statement, the amounts booked to OCI are "released" to the income statement, offsetting the earnings fluctuations from the price of jet fuel. The net result is that the derivatives are carried at market value on the balance sheet, but there is no volatility introduced to the income statement.

The accounting rules have an important implication for hedging strategy. If, for example, an airline forecasts that it will burn 100,000 gallons of jet fuel in a given month, hedges 100% of this usage, and then uses only 80,000 gallons, the portion of the derivative hedging the other 20,000 forecasted gallons must be released from OCI to the income statement immediately upon the determination that it is no longer probably that the full 100,000 gallons will be used. This will increase income statement volatility and also call into question the company's ability to forecast. If

[17] Much of this section was researched using an Ernst & Young LLP derivatives publication (2001)

the company repeatedly demonstrates an inability to forecast their usage and thus overhedges, they may be precluded from using cash flow hedging strategies in the future. Therefore, it is a common practice for firms in many industries to hedge up to the level they are certain to use, and remain unhedged for any additional consumption. Firms, such as Southwest, that claim to be 100% hedged at times must therefore have very sophisticated forecasting systems.

III. Industry Survey

During periods of rising oil prices, airlines can derive tangible benefits from hedging fuel costs; however, despite these benefits the 13 domestic airlines included in this analysis do not follow a similar fuel hedging strategy. This section outlines the primary benefits of a fuel hedging strategy as well as describes the various fuel hedging strategies of industry participants. Exhibit 2 summarizes the fuel expense and hedging strategies for the 13 domestic airlines included in this analysis. Appendix 2 includes samples of jet fuel disclosures in the airlines' SEC filings.

EXHIBIT 2
Airline Fuel Expense and Hedging Summary

		Fiscal 2003						Max Maturity		
		ASM	Per ASM		Fuel as a %	Current	Years Fuel	of Fuel	Avg % of Fuel Hedged	
Company	**Ticker**	**(in millions)**	**Revenue**	**Fuel Exp.**	**of Op Exp**	**Ratio**	**Hedged**	**Hedge (yrs)**	**FY04**	**FY05**
Airtran Holdings	AAI	10,046	$0.091	$0.018	21.5%	2.61x	1999-2005	2.0	35.0%	12.0%
America West	AWA	23,373	0.096	0.016	16.4%	1.21x	1997-2004	1.0	11.0%	0.0%
American	AMR	165,209	0.106	0.017	15.2%	0.71x	1993-2005	2.0	12.0%	4.0%
ATA (1)	ATAH	21,126	0.072	0.013	19.2%	0.29x	2001-2002	1.0	0.0%	0.0%
Continental	CAL	78,385	0.113	0.016	14.5%	0.90x	1996-2003	1.0	0.0%	0.0%
Delta	DAL	134,000	0.099	0.014	13.8%	0.75x	1996-2004	3.0	32.0%	0.0%
Frontier	FRNT	2,841	0.208	0.036	17.9%	1.65x	2003-2004	0.5	7.0%	0.0%
JetBlue	JBLU	13,639	0.073	0.011	17.8%	1.75x	2002-2004	1.0	40.0%	0.0%
Midwest Air	MEH	2,968	0.129	0.027	19.6%	1.38x	1997-2003	1.0	0.0%	0.0%
Northwest	NWAC	88,593	0.107	0.018	15.9%	0.93x	1997-2004	1.5	0.0%	0.0%
Southwest	LUV	71,790	0.083	0.012	15.2%	1.34x	1997-2007	4.0	82.0%	60.0%
United	UALAQ	136,630	0.100	0.015	13.7%	0.66x	1995-2003	2.0	0.0%	0.0%
USAirways	UAIR	58,106	0.118	0.014	11.7%	0.80x	94-97, 00-05	2.0	30.0%	5.0%

1) As of December 2003, ATA had not hedged any of its expected fuel consumption for 2004; however, it is typically reimbursed for approximately 20% of its annual fuel costs.

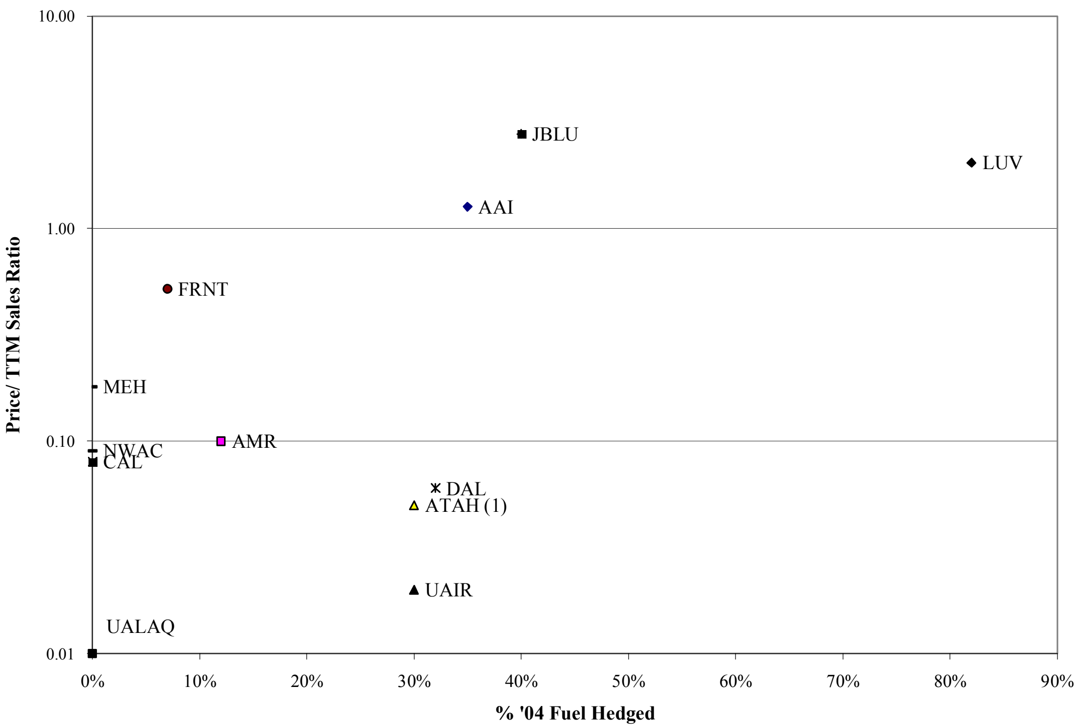
Source: Company SEC filings and Carter et. al. (2002). ASM = Available Seat Mile

Jet fuel represents a critical expense category for any airline that bears its own fuel costs and each of the airlines included this analysis bears at least 80% of its fuel costs. In fact, fuel has consistently been one of the largest expense categories for domestic airlines, ranking second only to personnel expenses. During 2003 fuel costs represented, on average, over 16% of the total operating expenses for the 13 domestic airlines included in this analysis. Moreover, airlines are generally unable to increase fares to offset any significant increase in fuel costs. From 2001 to 2003, these 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 airline pricing decreased by 0.1% (as measured by revenue per available seat mile). In addition, from February to May 2004 several airlines have 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. The latest move came from United on May 23 when the airline increased its fuel surcharge on selected flights and classes by $5, citing increased fuel costs as the cause. However, industry analysts doubt this surcharge will remain in effect as Continental attempted a $10 fare increase on May 17 but abandoned the increase within a week when other carriers did not respond with a similar increase.[18]

In addition to the obvious importance of controlling such a significant operating expense for an airline, numerous academic studies have demonstrated that measurable fuel hedging can increase the value of the firm. Carter et al. (2002) show that measurable fuel hedging by airlines can increase the value of the firm an estimated 12-16%, as was discussed previously in this paper. 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 firm's price to revenue ratio) included in this analysis do have a positive correlation coefficient with the airline's level of fuel hedging, as shown in Exhibit 3. We elected to present the price/revenue ratio rather than price to earnings because many of the airlines have negative earnings.

[18] CNN/Money article, *United raises surcharge*, May 26, 2004

EXHIBIT 3
Comparison of Airline Fuel Hedging and Valuation



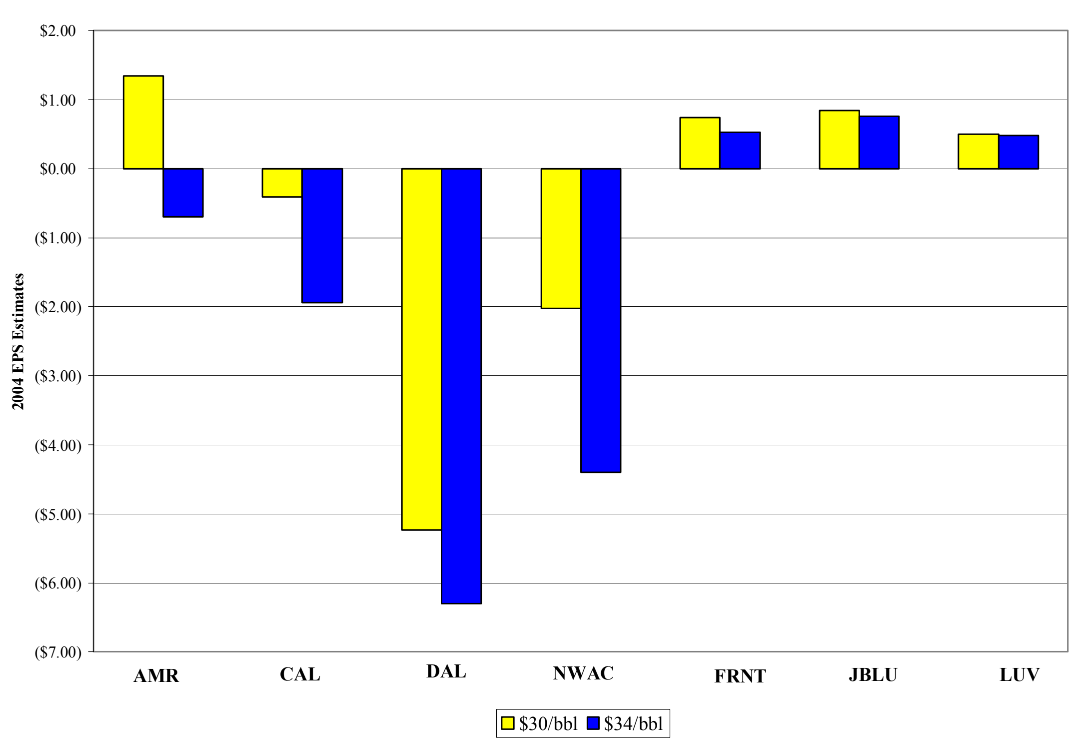
Sources: SEC filings and market data as of December 31, 2003

The impact of rising fuel costs on the profitability of hedged and unhedged airlines is readily apparent in 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[19]. As a result, earnings estimates based on a $30 per barrel spot price were revised downward for airlines with unhedged fuel. Exhibit 4 demonstrates the dramatic shift in 2004 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 of the major airlines with unhedged fuel

[19] Greene (2004)

will be able to avoid bankruptcy in the near term[20]. The airline industry's primary trade group, Air Transport Association, has even begun to lobby Congress regarding the release of fuel from the U.S. Strategic Petroleum Reserve.

EXHIBIT 4
Morgan Stanley's 2004 Airline Earnings Estimates as of March 2004



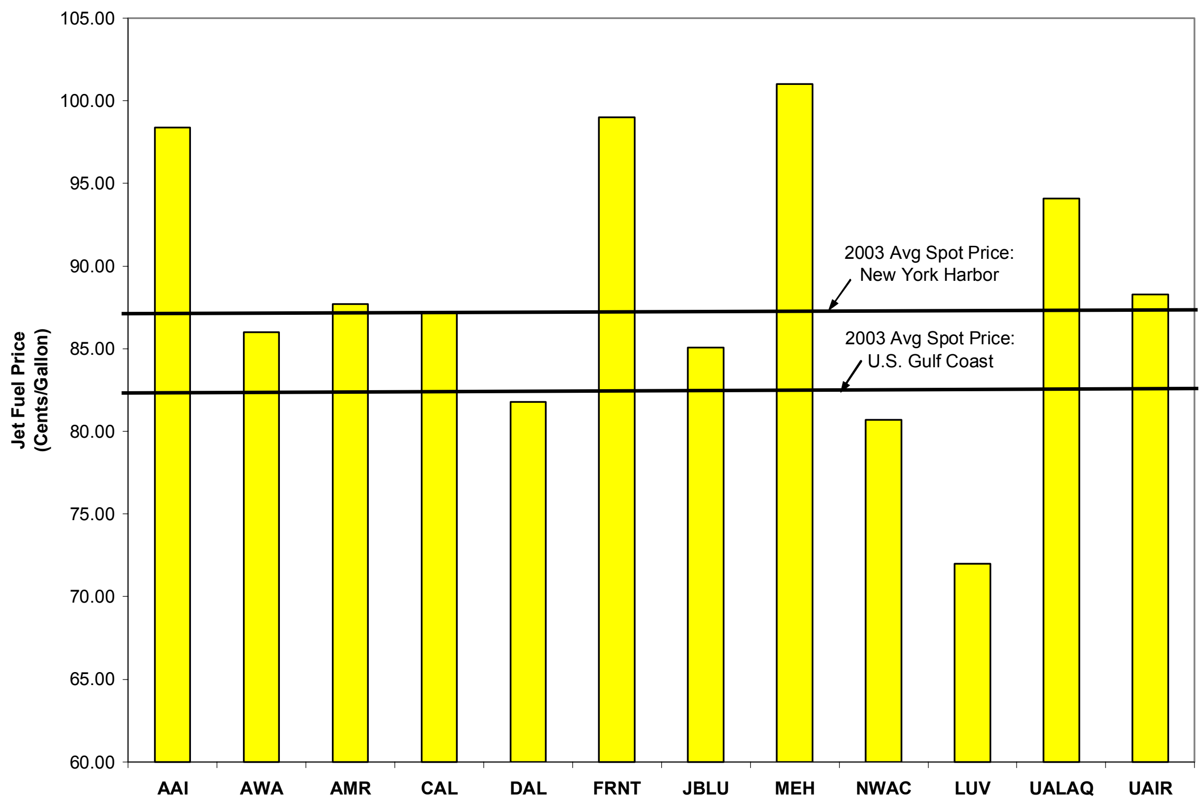
Source: Greene (2004)

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 Coast 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 average spot price for the year. Exhibit 5 compares the actual average airline fuel cost to the average New York and U.S. Gulf Coast jet fuel spot prices for 2003. In the first quarter of 2004, according to CEO Jim

[20] CNN/Money article, *Major airline closings seen*, May 25, 2004

Parker, Southwest's profit of $26 million would have been a loss of $8 million had they not been hedged against rising fuel prices.[21]

EXHIBIT [5]
2003 Avg Airline Fuel Cost vs Avg Spot Price



Source: SEC filings and U.S. Energy Information Administration

Southwest and JetBlue are the industry leaders in jet fuel hedging, as shown in Exhibit 2. With 82% and 40% of their expected 2004 fuel consumption hedged as of December 2003, both airlines have stated that fuel hedging is a key component of their low-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, through 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 of purchased call options, collar

[21] reflector.com article, *Southwest Air Hedges Bet on Oil Prices,* May 7, 2004

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 fuel 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 company outsources 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 airlines have hedged only a small portion or none of their expected 2004 fuel consumption, including American, Continental, Northwest, and United. Ironically, these are the airlines 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 and American's credit rating limits the types of contracts it can use.[22]

The empirical evidence we have observed from the SEC filings illustrates the value of hedging and supports the academic theory that hedging increases firm value. The airlines that have been the most successful over the past several years have sophisticated hedging programs in place, while those on verge of bankruptcy are largely in that position due to their jet fuel exposure. While

[22] SEC filings

there are certainly costs to hedging jet fuel purchases, such as personnel and bid-ask spreads, all evidence we have observed demonstrates that the benefits far outweigh such costs.

Appendix 1
Weekly Commodity Price Correlation Coefficients

		Settlement Price NYMEX Crude Futures (Days Forward)			
		30	60	90	180
	New York	0.937	0.930	0.921	0.897
Jet	Antwerp-Rotterdam-Amsterdam	0.932	0.925	0.917	0.882
Kerosene	Japan	0.837	0.825	0.813	0.778
Spot	Northwest Europe	0.926	0.918	0.909	0.882
Price	Singapore	0.840	0.829	0.817	0.783
	US Gulf Pipeline	0.959	0.955	0.948	0.926
	Source: Datastream				
	Date:	6/8/1990	to	1/2/2004	

		Settlement Price IPE Crude Futures (Days Forward)			
		30	60	90	180
	New York	0.939	0.935	0.930	0.916
Jet	Antwerp-Rotterdam-Amsterdam	0.966	0.965	0.962	0.950
Kerosene	Japan	0.963	0.961	0.957	0.944
Spot	Northwest Europe	0.947	0.945	0.941	0.925
Price	Singapore	0.969	0.967	0.964	0.952
	US Gulf Pipeline	0.969	0.967	0.964	0.952
	Source: Datastream				
	Date:	12/13/1996	to	1/2/2004	

		Settlement Price NYMEX Heating Oil Futures (Days Forward)			
		30	60	90	180
	New York	0.958	0.939	0.917	0.868
Jet	Antwerp-Rotterdam-Amsterdam	0.953	0.942	0.924	0.852
Kerosene	Japan	0.871	0.856	0.831	0.752
Spot	Northwest Europe	0.949	0.937	0.917	0.852
Price	Singapore	0.874	0.860	0.837	0.759
	US Gulf Pipeline	0.978	0.967	0.952	0.901
	Source: Datastream				
	Date:	6/8/1990	to	1/2/2004	

		Exchange Rate		
		Yen/$	GBP/$	
	New York	0.020	0.018	
Jet	Antwerp-Rotterdam-Amsterdam	0.056	-0.058	
Kerosene	Japan	0.016	-0.119	
Spot	Northwest Europe	0.047	-0.059	
Price	Singapore	0.032	-0.141	
	US Gulf Pipeline	0.045	0.005	
	Source: Datastream			
	Date:	6/8/1990	to	1/2/2004

		Spot Price			
		Heating Oil			
		New York	Gulf Coast		
	New York	0.971	0.972		
Jet	**Antwerp-Rotterdam-Amsterdam**	0.916	0.955		
Kerosene	**Japan**	0.838	0.877		
Spot	**Northwest Europe**	0.913	0.952		
Price	**Singapore**	0.838	0.878		
	US Gulf Pipeline	0.944	0.985		
	Source: Datastream (Jet)/EIA (Heating Oil)				
	Date:	6/8/1990	to	1/2/2004	

		Settlement Price			
		NYMEX Heating Oil Futures (Days Forward)			
		30	60	90	120
	New York	0.984	0.962	0.942	0.923
Jet	**Antwerp-Rotterdam-Amsterdam**	0.980	0.980	0.971	0.959
Kerosene	**Japan**	0.931	0.927	0.912	0.891
Spot	**Northwest Europe**	0.978	0.976	0.966	0.952
Price	**Singapore**	0.940	0.938	0.926	0.907
	US Gulf Pipeline	0.990	0.986	0.976	0.962
	Source: Datastream (Jet)/EIA (Heating Oil)				
	Date:	2/11/1994	to	1/2/2004	

		Spot Price			
		WTI	Brent		
		Cushing, OK	Europe		
	New York	0.940	0.939		
Jet	**Antwerp-Rotterdam-Amsterdam**	0.933	0.946		
Kerosene	**Japan**	0.844	0.868		
Spot	**Northwest Europe**	0.928	0.942		
Price	**Singapore**	0.845	0.872		
	US Gulf Pipeline	0.960	0.964		
	Source: Datastream (Jet)/EIA (WTI)				
	Date:	6/8/1990	to	1/2/2004	

		Settlement Price			
		WTI Crude Futures (Days Forward)			
		30	60	90	120
	New York	0.938	0.933	0.925	0.917
Jet	**Antwerp-Rotterdam-Amsterdam**	0.933	0.929	0.921	0.913
Kerosene	**Japan**	0.843	0.820	0.820	0.808
Spot	**Northwest Europe**	0.927	0.914	0.914	0.905
Price	**Singapore**	0.844	0.824	0.824	0.812
	US Gulf Pipeline	0.960	0.952	0.952	0.945
	Source: Datastream (Jet)/EIA (WTI)				
	Date:	6/8/1990	to	1/2/2004	

				Jet Kerosene Spot Price		
		NY	ARA	Japan	NW Europe	Singapore
	New York	1.000	0.955	0.892	0.954	0.893
Jet	**Antwerp-Rotterdam-Amsterdam**		1.000	0.943	0.997	0.949
Kerosene	**Japan**			0.103	0.948	0.994
Spot	**Northwest Europe**				1.000	0.953
Price	**Singapore**					1.000
	US Gulf Pipeline					
	Source: Datastream					
	Date:	6/8/1990	to	1/2/2004		

Appendix 2
Sample Disclosures from SEC Filings of Domestic Airlines Regarding Jet Fuel

AirTran Holdings, December 2003 10-K:

Page 37:
"Aviation Fuel

Our results of operations are impacted by changes in the price of aircraft fuel. Excluding special items, aircraft fuel accounted for 21.5 percent and 22.0 percent of our operating expenses in 2003 and 2002, respectively. Based on our 2004 projected fuel consumption, a 10 percent increase in the average price per gallon of aircraft fuel for the year ending December 31, 2003, would increase fuel expense for the next twelve months by approximately $20.0 million, including the effects of our fuel hedges. Comparatively, based on 2003 fuel usage, a 10 percent increase in fuel prices would have resulted in an increase in fuel expense of approximately $17.9 million, including the effects of our fuel hedges. In 2002, we terminated our fuel-hedging contracts consisting of swap agreements and entered into fixed-price fuel contracts and fuel cap contracts to partially protect against significant increases in aircraft fuel prices. At December 31, 2003, we had hedged approximately 29 percent of our projected fuel requirements for 2004, as compared to approximately 41 percent of our projected fuel requirements for 2003 at December 31, 2002. During the first quarter of 2004, we entered into additional fixed price fuel contracts and fuel cap contracts that increased our fuel commitments to approximately 35 percent of our estimated fuel needs for 2004."

Page 52:
"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."

AMR Corporation, December 2003 10-K

Page 73:
“Fuel Price Risk Management

American 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.”

Bibliography

AFX News, May 17, 2004; *BA says fuel requirements 45% hedged in current year,* www.afxnews.com.

Carter, Rogers, and Simkins, September 16, 2002; *Does Fuel Hedging Make Economic Sense? The Case of the US Airline Industry*. Oklahoma State University.

CNN/Money article, May 25, 2004; *Major airline closings seen*, www.money.cnn.com.

CNN/Money article, May 26, 2004; *United raises surcharge*, www.money.cnn.com.

DerivativesStrategy.com, 1997; *Energy Hedging Lesson of 1996*. www.derivativesstrategy.com.

Ernst & Young, LLP, December, 2001; *Financial Reporting Developments: Accounting for Derivative Instruments and Hedging Activities*.

Greene, William March 8, 2004; *Reducing Estimates Across the Board due to Fuel*, Morgan Stanley.

Hull, John C, *Options*, 2000; *Futures, and Other Derivatives*, Prentice-Hall.

Jones, Key, March 10, 2003; *Strategic Risk Management*. BP Presentation at 5th Annual Armbrust Conference.

Levin, Doron, March 18, 2004; *Hedging helps low-cost airlines hold down price of aviation fuel*, The Detroit Business News.

McDonald, Robert L., 2003; *Derivative Markets*, Pearson Education, Inc.

Reflector.com, May 7, 2004; *Southwest Air Hedges Bet on Oil Prices,* www.reflector.com.

Southwest Airlines Co., April 29, 2003; *Fuel Hedging*. Presentation at Oklahoma State University.

Trottman, Melanie, January 16, 2001; *Southwest Airlines' Big Fuel-Hedging Call Is Paying Off – Carrier Was Able to Protect Itself Against Soaring Energy Prices in Second Half*. Wall Street Journal.

Wharton School of Business, 2004; *Fare Wars: The 'Friendly Skies' Are More Cutthroat Than Ever*, http://knowledge.wharton.upenn.edu/index.cfm?fa=viewArticle&id=992

Zea, Michael, 2002; *Is Airline Risk Unmanageable?* Mercer on Travel and Transport.