

# Integrated Risk Management on Fuel Hedging Program: A Case Study on Southwest and China Eastern Airlines

Chin-Yen Alice Liu  
Texas A&M University - San Antonio

Kevin J. Jones  
Indiana University - Purdue University

## ABSTRACT

*Controlling fuel costs is an operations strategy that can significantly influence and enhance the company's competitiveness in the airline market. With the implementation of the financial risk management procedures, airline companies have saved billions of dollars in fuel costs through the use hedging programs targeted toward the energy derivatives market. A hedging program is dependent upon purchasing contracts to supply oil at a lower than market price when oil prices increased. However, when the oil market prices decrease rapidly below the hedged price, the hedging cost control approach can easily backfire, especially on those companies which anticipated higher fuel prices. For example, Southwest Airlines (US) and China Eastern Airlines (China) have incurred huge losses when using a fuel-hedging program due to sudden price declines in the oil market. These unanticipated higher costs from hedging contractual agreements have become a financial drain on airline companies which used a fuel hedging strategy. This study compares the strategic and organizational response by Southwest Airlines and China Eastern Airlines to increased fuel costs due to fuel hedging. The responses of the two airlines was remarkable not only due to the ways in which they achieved a successful business partially attributed to fuel hedging to achieve lower fuel costs, but also due to the ways in which they responded differently after the huge losses attributed to the fuel hedging strategy. This investigation is conducted to detect and analyze the realities of fuel hedging comparing two airline companies and their financial results, which reflect the results of biased perspectives on risk management. As a result of this study, a better understanding can be achieved on how biased risk management perspectives affect information processing and decision making.*

## Introduction

With advanced information technologies, a number of financial derivatives products are available in the futures channel with timely services. Advance purchases of commodities via derivatives or entering into paper contracts for commodities at a fixed price for future delivery to protect against the shock of anticipated rises in price becomes a special means for corporate strategies. Consequently, many corporations effectively use financial derivatives products and step into the futures market to reduce the companies' expenses and optimize their profit. For example, with the

strong competition in the aviation industry, airline executives know that it is unfeasible to adjust airfares immediately because of the fluctuation on the oil prices. Since airline carriers have little power to raise prices in response to higher fuel costs, some companies like Southwest Airlines and China Eastern Airlines turned to a fuel hedging program to have better control on their jet fuel costs.

In the twenty-first century, the largest carriers in the aviation industry are facing their biggest challenge ever due to an outdated air-traffic-control system, competition from low-cost carriers, and increases in fuel costs. The major U.S. airlines, American, United, Delta, US Airways, Northwest, and Continental, reported big losses in 2005 (D'Agostino, 2006). Extraordinary circumstances, like the 9/11 disaster and fluctuating oil prices, can accentuate the challenge. Responding to these challenges, several airline companies have merged to improve their competitive position in the airline industry. A short list of these mergers includes:

- Southwest Airlines purchased of American Trans Air in 2008;
- Delta Airlines merger with Northwest Airlines between 2008 and 2010;
- United Airline merger with Continental Airlines between 2010 and 2012;
- American Airlines merger with US Airways in 2013 (“Past and Future,” 2013).

These mergers in part were facilitated to reduce operational costs. However, the cost of jet fuel, which is a major operational expense, cannot be fully addressed through merger. Given the reality that jet fuel is a variable expense, managing fuel costs becomes one of the operational strategies that can significantly influence and enhance the company’s competitiveness in the airline market. According to Clubley (1999), fuel price risk management techniques were adopted by the aviation industry around 1989. The need for financial risk management practices were in response to rapid increases in the crude oil prices during the Iran/Iraq War. The risk management approach used by airlines includes the use of derivatives products such as crude oil, heating oil, or jet fuel to hedge their fuel cost risk.

Both Southwest Airlines and China Eastern Airlines are notable examples of airlines that use long-term hedging contracts of crude oil to lock in lower prices to manage the overall fuel expenses in the United States and China, respectively. While other airlines used a fuel hedging strategy, Southwest Airlines became known for their proficiency in gaining low fuel prices using fuel hedging. For example, Southwest Airlines paid much less than the market price for its fuels while the spot price of oil reached its price peak before July 2008. As a result of the fuel hedging strategy, before the crude oil price went down, Southwest was one of the few airlines making a profit in the aviation industry. The profitability was strongly correlated to the success in securing lower fuel prices than their competitors. However, the rapid decline of the oil prices after July 3rd in 2008 disrupted Southwest’s cost control strategy, which subsequently resulted in a significant loss in the value of its fuel-hedging program. A similar issue also plagued China Eastern Airlines. The company reported a total loss of 13.9 billion RMB in 2008, which is more than 2 billion US dollars (Nicholson, 2009). Since the success of Southwest and China Eastern Airlines are often cited as well-known cases of success in the past few decades, we are more interested than ever in knowing the story behind their very first failure experience. What caused two very successful airline companies, widely recognized for making “smart” fuel price decisions, to lose significant sums using the same fuel hedging strategy? By studying these two airline companies, the aim of this study is to answer the following questions:

- (1) What is the effect of energy derivatives on an airline company?
- (2) What are the success factors for the implementation of energy risk management?
- (3) What lessons do we learn from the experiences of Southwest Airlines and China Eastern Airlines?

Additionally, we want to understand how Southwest Airlines reacted when fuel costs became higher later on. With a favorable fuel hedging program, Southwest's operational/financial strategy is notable and has become one of the largest airlines measured by the number of passengers carried each year within the United States (Velotta, 2012).

## Energy Derivatives Market

In the last few decades, derivatives have become more and more important in the financial world and now are traded actively on many exchange markets throughout the world (Mastro, 2013; Hull, 2012). Researchers have developed various theoretical frameworks which can instruct firms on the applications of derivative products. Particularly, in the internet era, online trading makes the manipulations of derivatives more convenient and efficient, owing to the rapidly advancing information technologies and the stimulated financial engineering ideas.

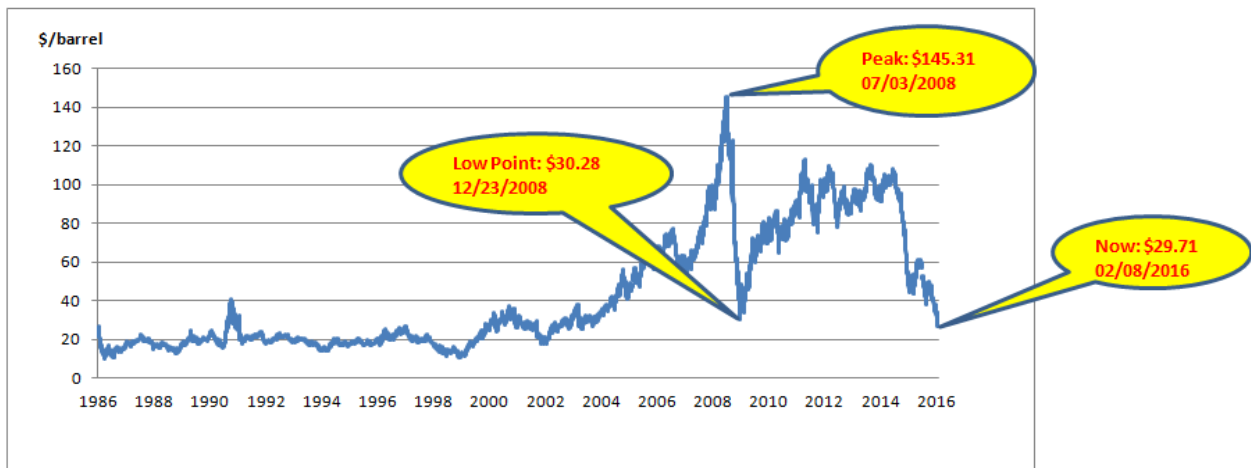
Since the late 1970's, nations have moved toward deregulation and globalization in the world of finance. More new and innovative financial products were created to fulfill the needs, which also made commerce more competitive. As a result, a wider range of participants entered the energy markets, prompting the development of the first exchange-traded energy derivative securities (Fleming & Ostdiek, 1999). Although derivative securities provide economic benefits, the downsides of the financial deregulations are to increase the degree of uncertainty for the energy prices and to shift the government's responsibility for winning and losing in the market (Fleming & Ostdiek, 1999; Sill, 1997). Currently, there are three main types of derivative products: *futures contract*, *forward contract* and *option* (Hull, 2012; Chance, 2001). Meanwhile, as one of three main types of trading activities in the derivatives market, the *hedge* intends to diminish or eliminate the market risk associated with the price of asset by operating derivatives products.

## History of the Crude Oil Price

The oil market has had dramatic increases in price volatility with the continuing deregulation of the energy markets, especially in the current decade. It is because crude oil price is highly correlated to our daily transportation expenses, especially for the jet fuel price. Consequently, financial derivatives backed by crude oil have a very active trading market. According to Department of Energy, crude oil and its derivatives, such as heating oil and gasoline, are the most commonly traded commodities traded in the Exchange. Airline companies frequently use those financial derivatives as hedging vehicles to gain cost advantages. Figure 1 exhibits the New York Mercantile Exchange (NYMEX), West Texas Intermediate (WTI), light sweet crude oil prices since 1986. Starting from 2000 to 2003, the daily price of crude oil has fluctuated between \$17 and \$38 per barrel. However, an upward movement in the price of crude oil has occurred since the beginning of 2004. On July 3, 2008, the price of crude oil hit a record high of \$145.31 per barrel in the NYMEX market. Since then, the daily price of crude oil rapidly dropped back to

\$30.28 per barrel on the end of 2008. Within a half year, the price of crude oil per barrel has fallen approximately \$115. In March 2011, the price of crude oil came back to \$100 per barrel and then fluctuated between \$80 and \$110 per barrel since after. Recently, the price of crude oil went down again. Since the beginning of the August 2014, crude oil price fell below \$100 per barrel and stayed below that price range. According to the 2014 forecast from US Department of Energy, Energy Information Administration (EIA), we would continue enjoying this price range until end of 2015. As expected, crude oil price not only stayed in a low price range but kept sinking and has reached its lowest level since 2004. As of today, crude oil price is below \$30 per barrel, which was below the lowest point in 2008.

**Figure 1: NYMEX WTI Crude Oil Spot Prices since 1986**



Data Source: US Department of Energy, Energy Information Administration (EIA), 2016

## Applications of Energy Risk Management

Many scholars, such as Fleming and Ostdiek (1999), Pilipovic (2007), and Hull (2012), have demonstrated that derivative securities provide an efficient means of transferring risk and promote information dissemination. Since the information will influence the underlying commodity prices, and because of price, the commodity production, storage, and consumption decision will change as well, the derivatives market plays an important role on resource allocation in the financial and economic system. It also holds true for energy market.

## Forward and Futures Contracts

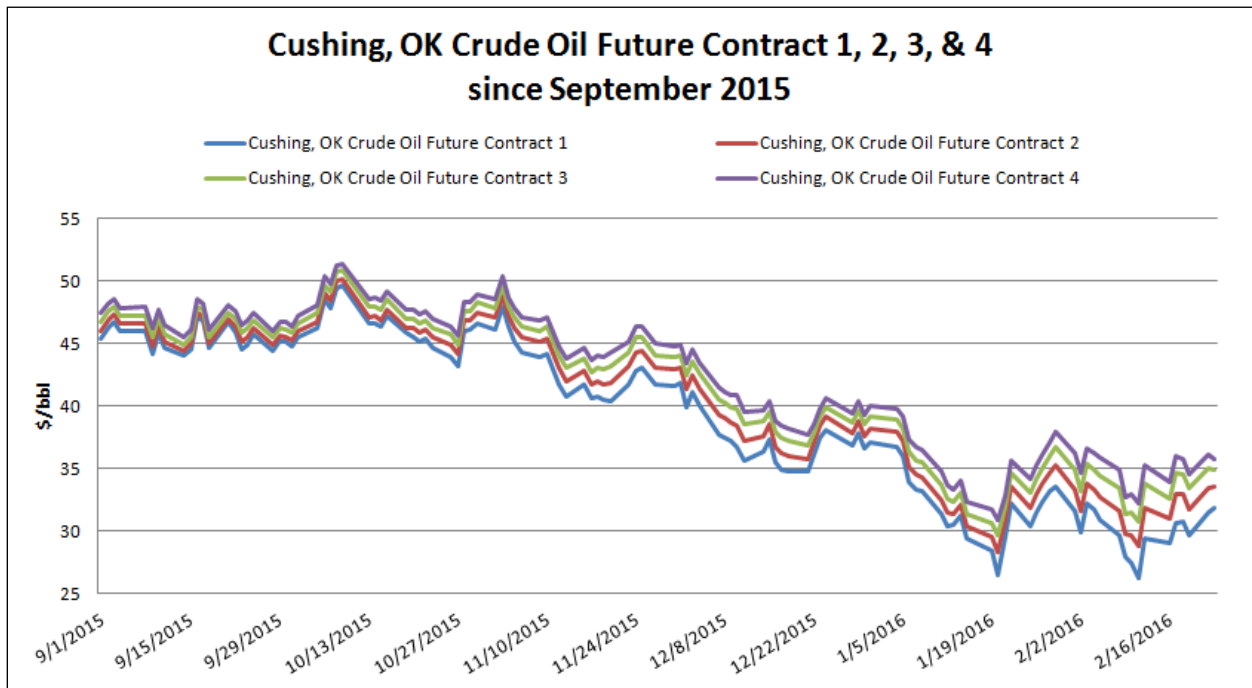
Given that jet fuel (the by-product of crude oil) is the only aviation fuel, and the fuel cost accounts for 40 percent of airlines' total operation expenses, controlling transportation costs becomes one of the important operations strategies that can significantly influence and enhance the company's competitiveness in the airline market (Haastrup, 2009). Consequently, some airline companies have been trying to reduce variability of jet fuel prices through hedging activities on derivative markets. The purpose of energy derivatives is to reduce risk exposures and bolster capital stability, during periods of fluctuation in fuel costs, and Southwest Airlines has been cited as an

example of an organization whose strategy incorporated a fuel hedging strategy (Brooks, 2012; Mutzabaugh, 2007).

Futures contract, forward contract and options are the three major tools airline companies use to hedge the risk related to variability of the jet fuel price. A futures contract is a standardized contract to buy or sell an underlying asset. Futures contracts are traded publicly on organized exchanges including Chicago Board of Trade (CBOT) and the Chicago Mercantile Exchange (CME). A futures contract will specify the price quotation (U.S. dollars and cents per barrel), the type of settlement (i.e. cash or physical settlement), the quality of the underlying commodity (i.e., the acceptable sulphur content and API specific gravity), delivery month, last trading day, etc. In addition, a futures contract follows mark-to-marketed principle, which processes the daily gains and losses into actual cash gains and losses each night.

According to the NYMEX, crude oil is the world’s most actively traded commodity, and the NYMEX crude oil futures contract has the largest-volume trading on a physical commodity in the world (CME Group, 2014). Each contract expires on the third business day prior to the 25<sup>th</sup> calendar day of the month before the delivery month or the last business day before the 25<sup>th</sup> calendar day of the month if the 25<sup>th</sup> of calendar day is a non-business day. If the original listed expiration day is a non-business day, expiration will move to the business day immediately prior (CME Group, 2014). Figure 2 displays the NYMEX crude oil futures prices in contracts 1 (i.e., the delivery month is the calendar month following the trade date), 2, 3, and 4 (i.e., the delivery month is the successive delivery months following contract 1) since September 2015.

**Figure 2: NYMEX WTI Crude Oil Futures Prices**



Data Source: US Department of Energy, Energy Information Administration (EIA), 2016

Similar to the futures contract, the forward contract is an agreement between two parties to buy or sell an asset at a certain price fixed over a certain time, but a forward contract is a private agreement, which is not regulated at the federal government level, and the settlement only occurs at the end of the contract. Thereby, market participants may have some credit risk if the contract is not honored. However, if a forward contract is traded in the over-the-counter (OTC) market, it still does not need to follow those specified by an exchange, but the specification can be customized, and it may also need to follow the mark-to-market principle and daily margin calls (Hull, 2012).

## Options

Compared to futures contract and forward contract, options usually afford a more flexible way to hedge the market risk with limited cost. Technically speaking, options are a derivative product that offers their holder the right to buy or sell an asset at a pre-specified price (strike price) over a certain period of time. In particular, a call (put) option gives the holder the right to buy (sell) the underlying asset at a fixed price by a certain date. You should buy a call (put) option if you believe the price of underlying security is going to rise (drop) before the option is expired. If the price does go as you expected, you could exercise your option and make a profit minus the cost of the option, or trade the option for a profit without exercising it. However, if the price does not go as you expected, you would simply let the option expire and suffer the cost of the option (Hull 2012).

## Case Studies on Southwest Airlines and China Eastern Airlines

While most U.S. airlines companies posted huge losses and some of them even emerged from bankruptcy since 2005 (D'Agostino, 2006), both Southwest Airlines and China Eastern Airlines have built a successful business in the aviation industry in the United States and China, respectively. While Southwest Airlines is regularly cited as an organization which has used fuel hedging for strategic advantage, China Eastern Airlines also adopted the hedging strategy to smooth out fluctuations in the fuel prices. In order to lock in the low prices of crude oil for the future usage, both companies faced the challenge and risk on deciding how many fuels they should hedge, what price they should settle, and when they should exercise the contract. The following section demonstrates the fuel hedging program from these two companies.

### Southwest Airlines

Southwest Airlines has had a consistent profit year after year which is an anomaly in the airline industry. According to Mutzabaugh (2007), Southwest Airlines posted a profit for the 34<sup>th</sup> consecutive year in January 2007, and it also carried the largest number of domestic passengers among the U.S. airlines based on the report from the International Air Transportation Association. For many years, Southwest had a unique operations strategy for controlling its fuel costs and pricing policy. According to Southwest Airlines' 2000 annual report, it has been successfully taking advantage from crude oil price appreciation, reducing the volatility of crude oil prices, and boosting its profitability since 1973. Moreover, according to the 2007 annual report, Southwest Airlines saved more than \$3 billion in fuel costs through the hedging program since 2004. The report also states that at that time the company had hedged approximately 70% and 55% of expected fuel needs at the average price of \$51/bbl in 2008 and 2009, respectively, about 30% at

\$63/bbl in 2010, around 15% at \$64/bbl in 2011, and roughly 15% at \$63/bbl in 2012. In response to projections of increased crude oil prices, Southwest Airlines continued the fuel hedge strategy (see Table 1).

**Table 1: Energy Derivatives Contracts in Place by the 2<sup>nd</sup> (07/24) and 3<sup>rd</sup> (10/16) Quarter 2008**  
**Based on the Percentage of Estimated Fuel Needs by Southwest Airlines**

	2008 (4 <sup>th</sup> Q)		2009		2010		2011		2012	
	%	\$/bbl	%	\$/bbl	%	\$/bbl	%	\$/bbl	%	\$/bbl
24-Jul-08	80	58	70	66	40	81	20	77	20	76
16-Oct-08	85	62	75	73	50	90	40	93	35	90

Data source: Southwest Investor Relations, 2014

Even though crude oil price has increased dramatically from \$50/bbl in January 2007 to \$145/bbl in July 2008, the price of the crude oil has dropped rapidly back to \$30/bbl shortly after the commodity hit its peak price (see Figure 1, page 6). While many other airline companies were celebrating the plunging oil prices, this extraordinary circumstance became one of the triggers for Southwest Airlines' first quarterly loss in 17 years in the third quarter of 2008 (Pae, 2008). Compared with the corresponding period of 2007, Southwest Airlines' net income decreased \$282 million, or was down 74%.

Southwest Airlines has been the USA's leading discount carrier and made a consecutive profit for decades while other airlines profits were susceptible to various economic challenges. Southwest has long been aggressively using oil futures contracts to hedge against a rise in the jet fuel price although in recent years they have reduced their use price hedging. The money that Southwest saved from the hedging program since 1998 is equal to about 83% of the company's profit over the last 10 years according to Reed (2008). Hence, it is no doubt that hedging is a good strategy to manage and control the future uncertainty, and hedging helps a corporation to minimize risk and have sufficient funds to take advantage of investment opportunities. However, as Froot, Scharfstein, and Stein (1993) suggested, such hedging would be at best only partially correct. The airline may end up paying more than the spot market price for its contracted fuels.

Even though Southwest Airlines has posted a profit for the 34<sup>th</sup> consecutive year in January 2007, Ishikawa and Naka (2007) point out that "[the] knowledge a corporation has accumulated over a period of time may instantly become an unprofitable asset". In the third quarter and fourth quarter of 2008, Southwest Airlines reported back-to-back quarterly losses, mostly tied to fuel contracts bought before oil prices plunged. Southwest's executives acknowledged that 2008 was one of the most difficult years in the company's 38-year history and for the entire industry (Reed, 2009). Due to the significant decline in fuel prices at the end of 2008, the company started to rebuild its fuel hedge portfolio and significantly reduced its net fuel hedge position in place for the period 2009 through 2013 according to 2009 annual report, which also means that Southwest would have less protection against future increases. Nevertheless, Southwest still remained profitable in 2009 while other airline companies suffered in the so called "Great Recession of 2008. According to the 2013 Annual Report, the company did not lose any money from the hedge accounting for an entire commodity during 2011 or 2012. However, due to the increased volatility in energy markets in the

third quarter of 2013, the company did not make a profit from the hedge accounting for WTI crude oil derivative instruments. Due to the collapse of oil prices in 2008, the company has substantially reduced its fuel hedging in the future. “We will continue to carefully manage our fuel hedging portfolio to minimize the ever present risk of rising fuel prices” according to the 2014 annual report.

## **China Eastern Airlines**

China Eastern Airlines, one of three biggest airline companies in China, has used fuel hedging as a financial risk management strategy. As a major player in China’s aviation industry, China Eastern has also been substantially impacted by rapid increase of oil price. In 2008, fuel cost of China Eastern reached 18.4 billion RMB (estimated 3 billion in 2014 US dollars), a 22% increase from previous year. Under continuous pressure of fuel cost as profit-eating factor, China Eastern has turned to financial derivative market for fuel-hedging strategy. Unlike Southwest, the fuel-hedging strategy at China Eastern mostly depends on oil option contracts rather than oil futures contracts. Since 2003, China Eastern has entered into contract with several investment banks. The contract includes long call options and short put options at the same time. Long call options allows China Eastern to lock fuel cost at a desired level. Meanwhile, short put options covers China Eastern’s expense on purchasing those calls. From 2003 to 2008, China Eastern has successfully carried out this strategy by buying long-term call options and selling substantial amount of put options. In 2007, the profit of China Eastern coming from its fuel hedging strategy was 210 million RMB (estimated 34 million in 2014 US dollars).

However, the situation has turned around since late 2008. Similar to the Southwest Airlines, China Eastern Airlines also posted a 6.2 billion RMB (estimated 1 billion in 2014 US dollars) loss on fuel-hedging contracts by the end of the year (Wang, 2009). This figure was raised to 13.9 billion RMB later according to the company’s financial report, which was much more than the profit which the strategy produced in 2007 (Nicholson, 2009). Moreover, because many of the derivative contracts that China Eastern has been involved in would not expire until 2010 or 2011, further losses were expected if fuel price was continuously sustained at a low level.

## **Lessons from Southwest and Eastern China Airlines**

So, what went wrong? How can the two companies, which used to be very successful in fuel hedging, suffer so much from significant financial loss? What can we learn from Southwest Airlines and China Eastern Airlines in terms of their strategic information processing decision making practices?

Fuel costs have been always the biggest concern of senior management in every airline company. For senior management, any fuel hedging strategy should serve one ultimate goal: keep the fuel cost low and stable as long as possible. As a result, airline companies are much more alert to the increased fuel price. In other words, for many airlines, their perspective on fuel hedging lies in keeping their fuel cost lower than that resulting from current market fuel price. In the first quarter of 2008, Southwest paid roughly \$2 per gallon for fuel, which is significantly lower than market price in the same period. And of course, once airline companies are confident that their strategies can meet this perspective well, they will sustain the strategy as long as possible. For instance, in



2004, Southwest decided to increase its maximum hedge maturities to three years (Carter, Rogers, & Simkins, 2004). However, the perspective of seeking fuel cost advantage as a revenue producing tool is actually biased for risk hedging purpose. The bias is seen in the expectation that the hedged price will be lower than the market price. In essence, there is an assumption that locking in a lower price will result in lower cost despite the reality of fluctuating prices in the energy market. By emphasizing keeping fuel costs down, companies like Southwest and China Eastern desperately look for a strategy which seems to promise low and stable fuel costs. However it should be noted that no advantages come without risks and potential costs. The hedging strategies of Southwest and China Eastern, blinded by their biased perspectives, have actually exposed themselves to substantial financial risks during times of economic upheaval. Those risk factors would harm the two companies to a great extent if the market moves in unexpected direction. For Southwest, a futures contract is relatively simple and cheap tool to lock fuel price. However, the downside of those contracts lies in the fact that futures holders are under the obligation to take on any loss caused by unexpected price movement of the underlying asset. Sometimes, the loss accumulated to significantly high level. Moreover, holding long-term futures contract can make situation even riskier.

Compared to Southwest, China Eastern operated its fuel hedging strategy in a way described as “suspiciously like speculation” by a local newspaper (Wen and Li, 2009). According to the newspaper, China Eastern has signed fuel-related derivative contracts with an international investment bank. Based on the contracts, if oil market price exceeds \$118 per barrel, the bank is obligated to pay China Eastern the difference between oil market price per barrel and \$118 but no more than \$20 per barrel. On the other hand, if oil market price is below \$82.75 per barrel, China Eastern will have to pay the bank twice the difference between \$82.75 and market price. This hedging contract does not create an appropriate balance between cost reduction and potential obligation, and it also puts China Eastern Airlines into a position facing significant downside risk.

When facing the substantial increase of price volatility, the financial results from Southwest and China Eastern indicate that both companies were not yet been able to quickly and effectively adjust their hedging positions on the energy market. Technically, the cases of Southwest and China Eastern give us a warning and, show that flexibility is one of the most important factors for any successful hedging strategy. More importantly, in a strategic sense, risk management can add value, but a biased perspective toward risk management can also cause a harmful result (Smithson & Simkins, 2005). It is essentially because the biased perspective with the assumption and expectation that the outcome will be successful despite the reality of the inherent risk associated can easily make senior management bypass much valuable information and have inefficient information processing and management, then making potentially a harmful decision. A notable example is that the energy market has been experiencing rapid change and substantial price fluctuation since 2004 (see Figure 1, page 4). In the time period of 2000-2004, the estimated monthly average crude oil price is \$26.19 per barrel with estimated standard deviation equal to \$5.41 per barrel. In contrast, those values are \$67.45 and \$23 respectively in the period from early 2005 to September 2008 which was right before the oil price crash. Assuming crude oil price is normally distributed, a simplified projection will suggest that there is roughly a 16% chance for crude oil price to drop below \$45 per barrel in the future. Unfortunately for Southwest and China Eastern, this price drop is exactly what occurred after October 2008. Apparently, both Southwest

and China Eastern did not pay enough attention to the potential for such price variation and the consequences.

Some may express concerns that hedge against fuel price volatility did not provide adequate protection; knowing that hedge is designed to offset the uncontrollable factors in order to avoid the risk. This strategy should not be used for the income producing activities. With both Southwest and China Eastern, their primary job as an airline company is to ensure that they can deliver their passengers to the final destinations safely and on time and deliver a positive customer flight experience in the most efficient and cost effective manner. Even though Southwest and China Eastern airlines have both lost money on their fuel hedging programs when crude oil price went down, they have reduced the risk of exposure on the crude oil price fluctuation (which is something that they cannot control) and subsequently reduced the impact of fuel price fluctuations on their profits. On the other hand, if crude oil prices went up, the fuel hedging programs can help Southwest and China Eastern airlines protect their profits. Despite the potential risks of fuel hedging, it seems that the overall strategy works effectively over time. Consequently, airline companies like Southwest or China Eastern airlines should continue utilizing fuel derivatives to reduce the exposure of fuel price violations, but at the same time the company should maintain an appropriate level of knowledge to measure the performance of its hedging activities and procedures for execution on derivative instruments through the appropriate levels of management.

## Conclusion

Although fuel hedging programs provide Southwest Airlines and China Eastern Airlines with significant price protection on transportation costs when fuel prices are rising, these programs are also the triggers for those companies' losses, which bring concerns about the risks of hedge and efficiency of risk management. In an era of the higher volatility on fuel prices and the economic uncertainty, financial risk managers in the aviation industry should emphasize flexibility of their strategies which are more suitable for the liquidity and pricing fluctuations. More importantly, successful business strategies are based on objective perspectives which demonstrate a willingness to be open to and subsequently recognize that there is inherent risk in every strategy and therefore remain open to changing conditions to reduce the impact of biased perspectives that can lead to adverse results. Otherwise, biased perspectives may result in ineffective information processing and management; eventually resulting in business decisions that are contrary to desired company outcomes. Regarding fuel hedging strategy, airline companies should not only focus on holding fuel costs down, but also need to focus on reducing impact of fuel price fluctuations on company's operations. Unfortunately, the literature regarding impacts of what we have described as "biased perspectives" on enterprise financial risk management is limited. While Busenitz's (1999) work is in a similar direction, we believe much opportunity remains for scholars to address this important area of strategic thinking. It is hoped that this article creates the need to further discussion on the challenges of avoiding a biased perspective in financial risk management and working to sustain an objective perspective in overall enterprise risk management approaches.

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