BUSM36: Degree Project in Corporate and Financial Management

VALUE OF HEDGING IN U.S. AIRLINE INDUSTRY: A Perspective on Firm Value and Accounting Performance

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Abstract

Title:	Value of Hedging in U.S. Airline Industry: A perspective on Firm Value and Accounting Performance
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Five key words:	Risk Management, Hedging, Firm Value, Tobin's *q* and Accounting Performance
Purpose:	The purpose of this research is to investigate the value premium associated with extent of hedging in the U.S airline industry and to study the result of hedging on accounting performance as a proxy of firm value.
Methodology:	A quantitative analysis using Multivariate Regression has been applied to determine value effects on firm value measures of Tobin's *q* and accounting variables (ROA, ROE and EPS)
Theoretical Perspectives:	The classical risk management theory of Modigliani and Miller (1958) and other subsequent theories which support the notion of hedging are used. In addition, accounting performance variables explain the accounting perspective of our research.
Empirical foundation:	The main approach used in our analysis is based on the Allayannis and Weston (2001) model to measure firm value. This is supplemented with previous empirical research mainly Carter *et al* (2003, 2006) in U.S. airline industry on hedging.
Conclusion:	During the period 2006 to 2010 the study exhibits the existence of hedging value premium of 22.2% if a firm hedges 100% of its fuel price risk. Hence, it indicates that higher hedging would increase value (Tobin's *q*). Moreover, the accounting performance as measure of firm value shows no relationship with hedging, and not complementing our result of firm's value (Tobin's *q*)

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1. INTRODUCTION

1.1 Background of the Study

Rising fuel prices have always been a concern for industries whose majority of the operating costs is fuel based. A good example of this is the global airline industry in which fuel costs comprises approximately 31% of the operating costs at time of higher fuel prices.[1] Keeping this in mind, airline industry is constantly exposed to fuel price risk due to changes in economic and natural events. Uncertainty in major oil producing countries like Iraq and recent political instability in Libya and natural disasters like hurricane Katrina which severely affected United States oil industry all have a certain negative effect on airline industry's cost structure. Recently Arrow Air, a U.S. cargo airline filed for Chapter 11, on July 1st 2010, solely because of its inability to cope with higher fuel prices. To counter these problems, the airline companies hedge their fuel price risk by trading futures, forwards, option contracts and many other structured derivatives like "oil linked notes". The purpose of hedging is to reduce volatility in earnings and cash flows which leads to higher firm value which is an indicator of firm's good performance. The question is whether these instruments are effective in increasing firm value and are able to increase shareholder value in terms of higher dividends, capital gains or equity value.

So this leads us to a clear problem on identifying the extent to which oil price hedging creates value. This would further help us to extend our research to see the effects of hedging on accounting performance. As hedging reduces earnings volatility and effects variables such as net income, it is necessary to see its impact on accounting measures which are based on historic data.

1.2 Problem Statement

The major issue to be answered is to what extent reducing fuel price volatility through hedging has value effect on US commercial airlines during the period 2006-2010 and

[1] General Aviation Bureau (GAB), http://hubpages.com/hub/rise-in-fuel-prices-airline-industry, Accessed April 2, 2011at 1435 hrs.

whether accounting measures as a proxy of firm performance, can complement the value effect of hedging.

After identification of our problem it is necessary to explain how we have deductively reached to our problem statement. The next heading will discuss the problem statement from a general overview of hedging and then explaining which industries hedge and whether there is any value effects proved in previous studies. Then we will specify the relative importance of fuel as energy source in transportation industry especially airlines and why it has become important to perform a new empirical analysis.

1.3 Problem Discussion

The fact that we live in a non-perfect world where there are taxes, transaction costs, information asymmetries and costly bankruptcies, indicates that any attempt to reduce these would create value. This is in contrast with Miller and Modigliani (1961) who proposed that in a perfect world any attempt to change capital structure and manage risk would not affect the firm value. Shareholders who are considered to be as knowledgeable as managers would diversify themselves and would not value the firm's actions on it.

Considering the fact that risk management does carry some value in the real world, theories started to develop on why firms should manage risk and how risk management creates value. Hedging reduces financial distress cost, reduces expected tax liability according to Smith and Stulz (1985) and reduces underinvestment problem according to Myers (1977). Following these theories, empirical research started to take place measuring the impact of these factors on the firm value. The purpose was to identify the relationship between risk management and firm value and quantify the value creation. For this reason several researchers took different samples like different industries and differentiated between financial and non-financial firms' *e.g.* Allayannis and Weston (2001) tested non-financial firms, whereas, Jin and Jorion (2006) studied the oil and gas industry.

Hedging could be done based on the nature of the company and its operations, and can be divided into commodity, currency and interest rate hedging as identified by Geczy *et al* (1997). Companies that rely on commodities such as metals, oil *etc.* undergo commodity hedging. Firms having international operations and whose revenues are in several currency use exchange rate hedging to fix the value of one currency in terms of other currencies. Firms with high debt and borrowing requirements invest in interest rate hedging to fix the fluctuations in interest rates which can reduce financial distress cost and can increase firm value.

Allayannis and Weston (2001) showed that the use of currency derivatives is positively related to the firm value using the Tobin's *q* model. He studied 720 U.S. non-financial firms residing in 35 countries during the period 1990 to 1999. In contrast Hagelin's (2003) investigated Swedish firms' use of financial hedges against foreign exchange exposure and found no evidence on translation exposure hedges used to increase firm value. Jin and Jorion (2006) investigated oil and gas industry and found no relationship between commodity derivatives and firm value. Similar to this Tufano (1996) found little support for hedging in gold mining industry.

Sticking to the commodity sector and coming across enough empirical evidence, we come to know that fuel is the engine of any economy as oil comprises of majority of total energy usage by the whole world. One of the heavy users of oil is the transportation industry whose rise and fall totally depends on availability and prices of fuel. USA is the world's largest economy having a GDP of $14,802,081million in 2010 according to Euro Monitor International[2]. Its transportation sector consumed 27.1% of U.S. total energy consumption in 2009 (U.S Department of Energy, Information and Administration), as tabulated in Exhibit 1 which shows its heavy dependence on fuel. The airline sector in the transportation industry is highly dependent on jet fuel availability and jet fuel prices which represent 12% of fuel consumption of entire transportation industry (Airline

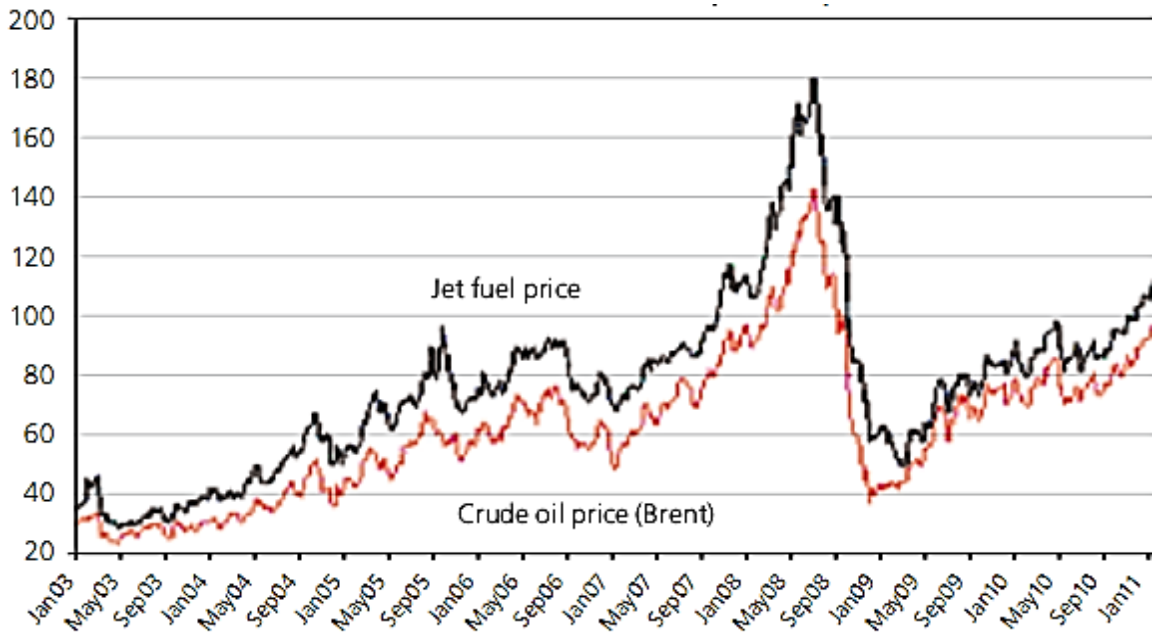
[2] Euro monitor Global Market Research Blog, (2010) Top 10 largest economies in 2020; http://blog.euromonitor.com/2010/07/special-report-top-10-largest-economies-in-2020.html, accessed on May 2, 2011 at 1425 hrs.

International Issue 2006)[3]. This along with the size of airline industry makes U.S. an appropriate target for research to find out how airlines performance is affected by changes in any attempt to hedge fuel. For our research we have chosen the airline industry, as according to our knowledge empirical research on fuel hedging in airline industry are very few, and the main studies being Carter, Rogers and Simkins (2003 and 2006). The airline industry has gone through waves of mergers and consolidations which have reduced the number of airlines with the passage of time. Conditions have changed and earlier empirical results may not be practical or relevant anymore. Carter, Rogers and Simkins (2003) studied the period 1994 – 2000 which was before the dot-com bubble and September 11 attacks. These challenges, especially the September 11 attacks were unexpected events which mainly affected the airline industry. In response airline industry took special measures to protect themselves like cost cutting measures, extensive hedging and change of strategies which were different from the norms. So keeping this in mind the empirical evidence needs to be reviewed to see whether the same positive relation exists between hedging and firm value and whether the hedging premium of 10% is still applicable as found by Carter, Rogers and Simkins (2003). Moreover, jet fuel prices reached its peak in year 2008 going up to $180 per barrel due to political unrest in Middle East and freezing winters in North America which focused production on heating fuel as shown in *Figure 1*on the next page. All such events had a definite impact on the firm's income which is an accounting measure due to increase in firms costs. So it is equally important to see the effects of hedging on certain accounting ratios like ROA, EPS and ROE as proxy of value. To conclude, a number of related arguments affecting the airline industry have made earlier studies less applicable in the current situation and new empirical analysis has become necessary.

[3] Fuel Consumption and alternative fuels, Fuel for Thought, *Airline International Issue* (2006) http://www.atag.org/content/showissue.asp?level1=3&level2=472&folderid=472&pageid=1084

Figure: 1

Jet Fuel and Crude Oil Price ($/barrel)



Source: Platts, RBS

We feel that there is a strong need to update the empirical research to corroborate the existing studies mainly Carter *et al* (2003, 2006) and to further advance this study by adding a different perspective of accounting performance. For that reason, we want to include certain accounting measures into our research and to prove that not only hedging and firm value are interrelated but also that risk management has an effect on accounting performance of the firm. This is to further prove the relationships between hedging and firm value using two different methods.

1.4 Reasons of the study

After reading through the problem statement and problem discussion some questions may develop into the mind of readers that why U.S. airline industry was chosen. U.S. airline industry is chosen due to the fact that U.S has the biggest airline industry comprising 13 operating listed airlines at present and the nominal amounts hedged are expected to be higher than airline industry in other countries so it would provide an accurate measure of

the relationship between hedging and firm value. Moreover, as we want to update the results of earlier research of Carter, Rogers and Simkins (2003, 2006) which were done on U.S. market so we have to resort to the U.S. airline industry.

Another aspect which needs to be addressed is why a period of 2006-2010 was chosen, though we are trying to see the changes in results after events like of September 11 2001, Iraq war 2003 *etc*. The reason is that in the period before 2006 there were a lot of mergers and bankruptcies in the airline industry which provided incomplete data sets. It was only from 2006-2010 that all listed airline companies survived during this period and no major restructurings took place. This provided consistent data. From this, we can also infer that there is no survivorship bias in our study.

1.5 Aims of the study

As aim is a long term objective, our aim of the study is to update and to add to earlier research in commodity price risk hedging. We would update the research by taking a different time period which is from 2006 to 2010 in contrast to the time period between 1994-2000 in Carter, Rogers and Simkins (2003) and 1992-2003 in Carter, Rogers and Simkins (2006) As world scenario has changed dramatically after 2000, as mentioned in earlier sections, our research would further show whether the hedging value premium has changed with respect to previous studies in the airline industry. Our addition to earlier empirical studies would be by also including the impact of hedging on measures of accounting performance in to our analysis. As to our knowledge this has not been performed earlier in the airline industry. It would provide a foundation for further studies in risk management by linking firm value with historic measures like accounting performance.

1.6 Delimitations

Our study does not focus on investigating motives and incomes from hedging and for this reason this industry is chosen as it does not use derivative instruments for trading purpose. We follow the assumption that airlines make no other gains from derivatives except hedging their fuel price risk. This is important to consider otherwise firm value can be affected both by hedging fuel price and companies gain from trading derivatives which will ultimately distort the results.

A second delimitation imposed by us is publicly listed airlines were selected due to their extensive information disclosure about their hedging activities. This delimitation is very important in this study because informative hedging disclosure is necessary in order to evaluate its effect on firm value.

1.7 Thesis Outline

The report continues with Chapter 2 which explains the overview of all the relevant literature, theories and empirical evidences related to our study. This chapter ends with a summary of the theoretical base used in our study. The third chapter relates to the methodology which focuses on our sample data, its characteristics and certain measures used to ensure data reliability. All the variables used in the study are also mentioned in this chapter. Following this, chapter four explains the use of model in data analysis. The results of our research are analyzed in Chapter 5 starting with the main findings and then comparing it with earlier studies. Chapter 6 concludes the whole study and then further mentions the future research possibilities and specific areas to be focused on.

2. LITERATURE REVIEW

2.1 Risk Management: An Ideal Perspective

Modigliani and Miller (1958) states that, hedging is a non-zero net present value (NPV) decision based on the assumption that transactions are costless, markets are perfect and there are no taxes and bankruptcy cost. In such a situation hedging does not produce value as shareholders can themselves diversify their shareholdings as best as managers can do for them, so there remains no motivation for firm to hedge their transaction

Contrary to the above description, the real world is different and there are market imperfections like different information with different parties *e.g*. Managers who have insider information, and transactions are costly in terms of search costs, termination costs *etc*. Taxes are charged by government as a source of revenue with different rates on corporate, wealth and capital gains. So hedging activity has some value effects and financial policy of a firm is relevant.

2.2 Development of theories

After the results of Modigliani and Miller (1958) were declared as unrealistic, work started on how hedging can affect value and what are the motives behind hedging. Subsequently, theories began to develop which are discussed as follows;

2.2.1 Financial distress costs

Financial distress arises when promises to creditors are not being honored or are served with difficulty. Such situations can force a firm into bankruptcy or liquidation which has costs such as fire sale discounts, advisory fees, legal fees *etc*. Financial distress is costly as it forces firms to take actions which are against the debt holders and non-financial stakeholders such as employees, suppliers and customers which propagates adverse selection and impairs the firm's access to credit. Stakeholder relationships are also affected by conflicts of interest between borrowers and lenders [Jensen and Meckling (1976), Myers (1977), and Stulz (1990)], between firms and their nonfinancial stakeholders [Baxter

(1967), Titman (1984), and Maksimovic and Titman (1990)], and between shareholders and managers [Gilson and Vetsuypens (1993) and Novaes and Zingales (1993)].

Booth, Smith and Stulz (1984) stated that, by reducing the volatility of earnings through risk management, firm can reduce the probability of financial distress as the firm's customers will place value on its services which will be reflected in the firm's cash flows in the form of willingness of the customer to pay the price. So hedging can be helpful in reducing earnings volatility and hence in controlling or reducing financial distress cost. High debt levels may cause firm to default and raises financial distress. So hedging increases with debt ratio according to Dolde (1995) Haushalter (2000).

2.2.2 Tax incentive

Tax incentives can motivate corporations to hedge as risk management has effect on expected tax liability, debt capacity and interest tax deduction. Such variables can increase or decrease firm value depending on their movement *i.e.* increase or decrease.

Smith and Stulz (1985) hypothesized that, firms having convex tax structure have motivation for hedging. As according to Jensen's inequality firms can reduce their expected tax liabilities by hedging which ultimately will reduce income volatility. Consequently firm value will increase due to stable earnings which are valued by stakeholders.

The other motivation is increase in debt capacity as explained by Stulz (1996), Ross (1997) and Leeland (1998). By reducing the volatility of income or the probability of distress through hedging a firm is able to issue more debt in response to higher debt capacity which increases the interest tax shield from debt. Consequently, a firm's tax liability is reduced and value of the firm increases due to reduced taxes, lesser volatility and interest tax deductions. However, Graham

and Rogers (2002) provided evidence that, tax convexity does not seem to be influencing hedging decision.

2.2.3 Underinvestment problem

Another important factor driving risk management is the underinvestment problems which as explained by Myers (1977) and Majluf (1984) that managers act in the interest of shareholders and turn down positive NPV projects due to the fact that the benefits accrue to the bondholders due to their prioritized status. The underinvestment problem arises when investment opportunities are negatively correlated with cash flows. For instance, airlines suffer from underinvestment when opportunity to buy distressed assets occurs during the time of recession when the firm itself is financially constrained. Froot *et al* (1993) and Carter *et al* (2006) showed that removing underinvestment problem was an essential factor and will allow firms to get hold of positive NPV projects resulting in higher cash flow generation. Bessembinder (1991) argues that, value of debt becomes less sensitive to incremental investment decision when a firm undertakes hedging at the time of financing. This reduces the motivation of managers to under invest to save bondholders. Nance *et al* (1993) provides evidence that hedging offers greater growth opportunities and mitigates underinvestment problems.

2.2.4 Managerial Risk Aversion

Risk averse managers engage in hedging if their wealth is concentrated in the firm and they find that hedging on their own is costly than hedging at the corporate level as discussed by Smith and Stulz (1985). Managers who hold company stock are more likely to hedge than managers that are rewarded with stock options as noted by Smith and Stulz (1985). Tufano (1996) also provides evidence that managers who own more stock are more likely to hedge. If it is cheaper for firms to hedge than it is for managers, then hedging increases managerial welfare. This will increase firm value as managers will not demand risk premium and thus it

will reduce managerial compensation. So the motivation for hedging is twofold both at the corporate and managerial level.

2.2.5 Other reasons to hedge

DeMarzo and Duffie (1991) and Breeden and Vishwanathan (1998) supposed that, informational asymmetries always exist in shareholder-manager relationship. DeMarzo and Duffie further stated that firms should sometimes hedge based on private information which cannot be transferred to shareholders without incurring any cost. Breeden and Vishwanathan (1998) are of the view that high quality manager has incentive to hedge to remove uncertainty and to give a positive signal to the market about his performance. Information asymmetry can be measured by share ownership of institutions in a firm. High institutional ownership firms have motivation to hedge less as founded by DeMarzo and Duffie (1991) and Breeden and Vishwanathan (1998). This is because the high institutional ownership implies less agency problems as large blocks of shares are in hands of few shareholders. Information asymmetry would be less as large institutional owners would demand more information and would themselves be having their own valuations. However, Geczy, Minton and Schrand (1997) found the opposite that firms with high institutional ownership are more likely to hedge.

2.3 Empirical Evidence: Hedging Vs. Firm Value

Firms engage in hedging activity in one way or the other. Some firms hedge foreign currency exposures and interest rate exposures while some engage in commodity price risk hedging. Bodnar *et al* (1996) and Mian (1996) show that firms engage in hedging activity to reduce risks. Geczy *et al* (1997) found that in a sample of Fortune 500 firms 52.1% use currency derivatives, 44.2% use interest rate derivatives and 11.3% use commodity derivatives. Most firms' hedge to reduce risk and increase firm value but does hedging has an effect on firm value?

Allayannis and Weston (2001) used 720 U.S non-financial firms to see the effects of hedging on firm value using Tobin's *q* as measurement of firm value. Evidence shows

derivatives hedging increases firm value by reducing currency risk. Carter, Rogers and Simkins (2003) focused on the U.S airline industry and evaluated firm value based on hedging oil price risk. They found a hedging premium of 10% and confirmed the positive effect of hedging on firm value. The confirmation of the existence of the hedging premium of previous studies is an important part of this report as it will re-investigate U.S airline industry with latest data which includes recessionary period as well. However, Jin and Jorion (2006) came up with contradictory results with past studies on hedging. They found negative relationship of firm value and hedging in U.S oil and gas producers.

To sum up, more empirical evidences are required in this area as there are conflicting results among the past studies. Consequently, studies based on recent data are necessary to incorporate the change of economic circumstances into our research to provide accurate results.

2.4 Main Criticisms of earlier researches

Earlier researches were unable to provide with consistent results in measuring the value of hedging. Allayannis and Weston (2001) sampled non-financial firms and found value premium, whereas, Jin and Jorion (2006) found no relationship between hedging and firm value in the oil and gas industry. It can be argued that hedging results are different in foreign currency hedging as founded by Allayannis and Weston (2001) and in commodity price risk hedging as performed by Jin and Jorion (2006). Moreover, Allayannis and Weston (2001) sample is limited only to large firms having assets above $500million and it is unclear whether hedging adds value to the smaller firms as well. The research sample of Allayannis and Weston (2001) covers a large number of firms in different industries with different growth rates *i.e.* a heterogeneous sample. The results may vary if the same research is done on a specific industry with consistent growth rates. The results of Allayannis and Weston (2001) may not be applicable to the oil and gas, gold mining and airline industry. This makes it necessary to perform more research into specific areas like commodity price hedging such as “fuel”.

The research most relevant to our study is Carter, Rogers and Simkins (2006). The fuel price risk in airline industry done by Carter, Rogers and Simkins (2006) studied the period between 1992 and 2003. The results by Carter *et al* (2006) may not have depicted the actual value affect because it includes data set which was affected by September 11 2001 incident. This event had a severe negative impact on tourism and so on airline companies. Airline companies faced a significant drop in their revenues and market values which may have resulted in a downward bias in the results of Carter *et al* (2006). Therefore, more specific and accurate data sets can reveal the true effect of hedging on firm value.

2.5 Accounting Performance

Accounting performance can be measured with profitability measures like Return on Assets, Return on Equity and Earnings per share. These are explained in detail below;

2.5.1 Return on Equity (ROE)

As a profitability measure Return on Equity reflects the effectiveness of a firm in using its shareholders funds *i.e.* how much a firm can earn with its shareholder capital. It also reflects the investment opportunities available to a firm and how effectively the firm is capitalizing on them. A higher ROE ratio shows good firm performance and attracts more capital and shareholder interest.

2.5.2 Return on Assets (ROA)

Return on Assets is another profitability measure which calculates the profitability of firm's assets in place. It shows how much profit is generated from each dollar of the invested asset. The higher the ratio the better is it for the firm and it reflects the strength of the company and the importance and efficiency of the asset it holds.

2.5.3 Earnings per Share (EPS)

Earnings per Share is a shareholder ratio which a shareholder studies before investing its capital in a firm. Earnings per share reflects the available earnings left to be distributed to shareholders after interest, taxes are paid. The higher the earnings per share the more the investors have confidence in the company and believes it to be a strong investment. Moreover, this ratio is not the actual cash paid to the investor as some of the earnings may have been re invested in the firm.

All the above accounting performance measures are subject to earnings management as they are accrual based according to Sougiannis, Jegadeesh and Konan Chan (2004). Management can use different techniques to inflate them and to increase the firm value as discussed by Lee, Li, Yue and Heng (2007).

Empirical evidence on hedging and accounting performance is not available subject to our knowledge in the airline industry. We find one study related to this done on non-financial firms in China in Wieying and Jian (2010). They found hedging has significant positive effect on Earnings per share. However, generally it can be implied in the sense that when hedging reduces tax liability as mentioned by Smith and Stulz (1985), the income available for distribution would increase and ultimately it would have positive effect on ROE, ROA and EPS.

Due to lack of empirical evidences of the relationship between hedging and accounting performance this aspect would be very important part of the research which would add a new dimension to the studies of hedging in the airline analysis.

2.6 Summary of the theories and empirical evidences

Figure: 2
Summary of Relevant Theories Empirical Studies and Result

Theory	Empirical Evidence	Results	Convergence/ Divergence of Results
PART I: General Hedging Theories			
Financial Distress Smith and Stulz (1985)	Dolde (1995) Haushalter (2000)	Higher debt which is a sign of distress leads to increased hedging	Converging Results
Underinvestment (Myers 1977)	Bessembinder (1991), Nance *et al* (1993)	Hedging reduces underinvestment	Converging results
Tax incentive Smith and Stulz (1985)	Ross(1997), Leeland (1998)	Hedging reduces tax liability	Converging results
Tax incentive Smith and Stulz (1985)	Graham and Rogers (2002)	Tax incentive does not affect hedging	Diverging results
Managerial Risk Aversion Smith and Stulz (1985)	Tufano (1996)	Risk averse managers and who own more stock hedge more	Converging results
PART II: Studies on Firm Value			
Authors	**Type of Hedging**	**Study Period and Market**	**Results**
Allayannis and Weston (2001)	Currency risk	1990-1999, USA	Derivatives increases firm value
Carter, Rogers and Simkins (2003)	Oil price risk	1994-2000, USA	Positive effect on firm value
Jin and Jorion (2006)	Oil and gas price risk	1998-2001, USA	No effect on value
Guay and Kothari (2003)	Currency and interest risk	1995, USA	Not significant affect but positive.

The table is divided into two parts .The part 1 explains the general hedging theories and their respective empirical evidences and then mentions whether the results were similar to theories (converging) or were different (diverging). Part 2 explicitly shows the studies relevant to our study *i.e.* relationship between hedging and firm value. It also mentions the results increase in firm value (positive), decrease in firm value (negative) or no effect.

The results of the table in the previous page are now discussed. Theories on risk management have been empirically proven as well to testify their validity. Theories of financial distress as claimed by Smith and Stulz (1985) have been empirically proven by Dolde (1995) and Haushalter (2000) that a higher debt ratio which is a sign of financial distress leads to increase in hedging. *Figure 2* above presents a summary of theories studied, their empirical evidences and their respective results.

It is interesting to find out the tax incentive motive as described by Smith and Stulz (1985) has contradictory results in empirical studies, as first round of empirical studies done by Ross (1997) and Leeland (1998) show hedging increases firm's debt capacity which motivates it to issue more debt to benefit from tax shields and hence results in value creation, whereas, Graham and Rogers (2002) show tax convexity does not seem to affect hedging decision. This can be due to different samples in both empirical evidences. So this can be taken as a research area in future studies as it requires further clarification. The under investment problem as explained by Myers (1977) and Majluf (1984) can be overcome through hedging as mentioned by Bessembinder (1991) and Nance *et al* (1993). So, theory is supported by empirical evidence which may be due to the fact that similar markets were being observed. Then the major studies regarding firm value and hedging such as Allayannis and Weston (2001) which shows a positive relationship and Jin and Jorion (2006) depicts no relationship. The most relevant study in our case is Carter, Rogers and Simkins (2003) which is based on airline industry and shows that hedging increases firm value.

3. METHODOLOGY

3.1 Type of Analysis

We are interested in a Deductive Quantitative Analysis of our problem because this study necessitates analyzing numbers in the form of percentage hedges to produce output in form of changes in firm value (Tobin's *q* ratio). As the percentage hedged and Tobin's *q* is numerical data so it qualifies for quantitative analysis. After this, again percentage hedged would be used to analyze its effect on ROA, ROE and EPS which are the accounting measures.

3.2 Data collection

The first task is to find out the number of airlines fully operating till the year 2010. Since the merger activity in the airline industry as mentioned in Morrison and Winston (2000) and Clougherty (2002), it has been difficult to get the accurate data. The data collection is secondary in nature as the research is based on what data is available on internet websites such as "Air Transport Association"[4], "RITA: Bureau of Transportation Statistics"[5], "Securities and Exchange Commission 10-K filings"[6] *etc*. The key operating data statistics both at the firm and industry level are found using publications of "International Air Transport Association" and "Bureau of Transportation". Information relating to individual hedging activities of the firm like percentage of fuel hedged is obtained from "SEC 10-K filings".

3.3 Data Sample

We find 122 certificated US Air Carriers operating as at August 2, 2010. These carriers include large, medium and small sized, public and private companies including both cargo and passenger airlines. For our study we need to find the amount of fuel hedged, with this, it is only possible to take companies that are listed and disclose their information and have SEC filings. Most of the listed airlines have undergone mergers in

[4] http://www.airlines.org/pages/home.aspx
[5] http://www.bts.gov/
[6] http://www.sec.gov/edgar/searchedgar/companysearch.html

the past and further reductions have taken place. For instance, in 2000, 27 U.S. airlines were investigated by Carter, Rogers and Simkins (2003). Reducing the number of airlines to listed companies operating at 2011 and which sufficiently report their hedging data, we identified 13 major U.S. airlines. *Figure 3* below shows the number of airlines and their percentages of fuel costs and hedged next year's fuel requirements. This left us with 65 firm year observations in the period 2006-2010.

Figure: 3

Percentage of Fuel Costs on Operating Expenses and Next Year Requirement Percentage Hedged

Year	2006		2007		2008		2009		2010		2006/2010	
Airline Companies	Fuel As % of Operating Cost	% Hedged	Fuel As % of Operating Cost	% Hedged	Fuel As % of Operating Cost	% Hedged	Fuel As % of Operating Cost	% Hedged	Fuel As % of Operating Cost	% Hedged	Fuel As % of Operating Cost	% Average Hedged
American Airlines	29.8	14	30.4	24	35.1	35	26.5	24	29.3	35	**30.22**	**26.4**
Airtran	36.5	33	37	43.7	45.5	41.6	31.4	41	34.8	52	**37.04**	**42.26**
Alaska	26	44	27	39	36	50	21	50	27	50	**27.4**	**46.6**
Unied Continental Holdings	21.5	36	27	25	39	34	27	34	31	35	**29.1**	**32.8**
Delta	25	38	26	24	38	62	29	24	30	38	**29.6**	**37.2**
Frontier (Republic Airways)	35	0	28	0	26.8	0	17.3	0	0	0	**21.42**	**0**
Hawaiian Airlines	27.3	18	29.9	14.75	37.9	31	22.7	33.5	26.5	37.5	**28.86**	**26.95**
JetBlue	33.6	38	36.2	13	42.6	8	31.4	40	32.4	28	**35.24**	**25.4**
South West	28	95	29.7	78	35.1	55	30.2	40	32.6	49	**31.12**	**63.4**
US Airways	29.8	29	30.7	28	26	0	18	0	21.6	0	**25.22**	**11.4**
Allegiant Air	46	0	48.1	0	51.2	0	37.9	0	43.6	0	**45.36**	**0**
Skywest Inc.	36.4	0	35	0	37.6	0	16.3	0	13.3	0	**27.72**	**0**
Great Lakes Airlines	24.8	0	28.4	0	35.3	0	24.2	0	27.3	0	**28**	**0**

3.4 Descriptive Statistics

To get a quantitative overview of the sample we use, it is necessary to look at the descriptive statistics of the data. This includes mean, median and the range. The *Exhibit 2* in the appendix describes the summary statistics of the variables used in the regression model. The main important variable is the percentage hedged ratio for the next year's fuel requirement as it is the main independent variable. The mean of this variable is 0.24 and the median is 0.25 which shows very little skewness and further tells that there are no

outliers in the data. Theoretically, a large difference between mean and median indicates presence of outliers and skewness.

3.5 Heteroskedasticity Test

As we are using panel data with seven cross sections there is likely chance that the variance of the error term is not constant as the number of cross sections are high according to Froot (1989). Constant value for error term is a necessary requirement for the Least Squares Regression Analysis in order to get accurate coefficients and confidence interval. Heteroskedasticity can be checked visually and through different tests. As *E-Views 7* doesn't support, the White's test (1980) *i.e*. Heteroskedasticity Test, we alternatively carried out the Visual Test. The Visual Test is based on independent variable, *%* Hedged (PC Hedged) being plotted against the Error Term *(E)*. The *Exhibit 3* in the appendix shows that the variance is very high which shows that the data is highly heteroskedastic. The heteroskedasticity causes biasness in test statistics and confidence intervals according to Forbes and Rigobon (2002). So we have controlled for heteroskedasticity in our study by using cross section weights in the regression as discussed by Greene (2003).

3.6 Data Consistency

To ensure consistency we have included only those airlines which remained till the year 2011. Airlines which have become subsidiaries formerly as independent are not included in the study as it would make incomplete data sets. As mentioned earlier this leads to a survivorship bias. As an example Frontier Airlines did not have data for the year 2010 as it became subsidiary of Republic Airways in 2009 so it was not incorporated as a separate airline in our research.

3.7 Hedging Data

As information regarding jet fuel hedging is the core requirement of this study we took strict measures to ensure the accuracy of this data. For this we resort to the SEC 10-k filings of the airline companies. In the 10-K filings keywords such as "derivatives" and "hedging" are searched to obtain the required information. The data available was the hedged percentage of next year's expected fuel consumption. Notional amounts of derivative contracts were also given but they were divided into assets and liabilities. Due to this complexity the notional values were not used and the expected fuel hedged requirements were taken. In some cases parent companies were not hedging but subsidiaries were hedging *e.g.* in the case of Republic Airways and its subsidiary Frontier was hedging future fuel requirements. In such cases due to the lack of data for subsidiaries we take the main or parent company's hedging strategy.

The above measures would help in providing an accurate and consistent data for our research. It would ensure that the figures of dependent variables of all the firms in this study are derived from the same source *e.g.* the "percentage hedged". All the airlines follow the same disclosure rules in stating their percentage hedge requirements which would further add a sense of authenticity and reliability in our study. Taking the values from the parent company's filings would allow us to take a broader view and more specific information about the hedging strategy of the whole firm.

3.8 Tobin's *q*

Using the model followed by Allayannis and Weston (2001) we investigate whether fuel hedging positively affects the value of the firm. In order, to achieve the results we study empirical relationships between Tobin's *q* (proxy for firm value) and fuel hedging.

The *q* value of a firm set forth by Tobin and Brainard (1968) and Tobin (1969) majorly defined as the ratio of Market value of outstanding financial claims of the firm to its current assets replacement cost. It's results can be interpreted as firms having *q* value higher than 1.0 have more ability to generate value from a given set of resources and those having values less than 1 are poor at utility and value generation .

Corporate performance can be effectively used to measure value as investigated by Montogmery and Wernerfelt (1988), Hyland and Diltz (2002), and Megna and Klock (1993).

Studies on airline performances are based on economic measures such as factor productivity (TFB) and unit cost methodologies according to Oum & Yu (1998) and Oum, Yu and Li (2000). To our knowledge only two studies have been done on airline's using Tobin's *q* *e.g.* Carter, Rogers and Simkins (2003, 2006). More studies on this would provide an opportunity to either verify or challenge the existing results which will open more room for questioning and new research areas.

3.8.1 Reasons for using Tobin's q

The first and the foremost reason for selecting *q* value is that it is a unit less firm specific and absolute measure of firm performance. This provides a common measure for all companies in a sector. Due to Tobin's *q* intrinsic linkage with intangible assets of the firm it can provide concrete evidence on the factors affecting firm value which can help airline managers to adopt different strategic measures. Moreover, Tobin's *q* is relatively simple model which gives results similar to those generated by complex models as discussed by Perfect and Wiles (1995). This simplicity frees us from intense data collection which saves computational cost. The relevance of this is higher in our study as the data relating to hedging is normally difficult to interpret and is not extensively discussed in annual reports.

3.8.2 Tobin's q Calculation

In this study we use the model developed by Chung and Pruitt (1994) as opposed to complex models of Lindenberg and Ross (1981). The reasons for this choice have been discussed earlier. This model is based on the fact that the replacement value of assets is approximated by its book value which makes it a simpler version. This alleviates the need to collect bond yields as well as different assets

replacement values. Tobin's *q* in this study has been calculated as follows in equation *(i)* as indicated below:

$$\boldsymbol{q} = \frac{\mathbf{MVCS+BVPS+BVLTD+BVINV+BVCL-BVCA}}{\mathbf{BVTA}} \qquad (i)$$

Where;

q = Tobin's q;

MVCS = the market value of the firm's common stock shares;

BVPS = the book value of the firm's preferred stocks;

BVLTD = the book value of the firm's long-term debt;

BVINV = the book value of the firm's inventories;

BVCL = the book value of the firm's current liabilities;

BVCA = the book value of the firm's current assets; and

BVTA = the book value of the firm's total assets.

The Market value of equity required to compute Tobin's *q* is calculated using the outstanding shareholders equity from the SEC filings. The *Figure 4* in the next page shows the values of Market Value of Equity and the respective Tobin's *q* figure calculated with the above mentioned formula *(i)*. While computing, repurchases of any stock is traced and is deducted from issued stockholders' equity in order to figure out outstanding amount. For the market share prices each year the price at the end of December *i.e.* last trading date before the start of a new fiscal year is taken. The reason behind is that, almost all the companies have fairly stable prices over the last week of trading during the end of the particular fiscal year.

Figure: 4

Market Value of Equity & Tobin's *q*

All Market Values in 000 $ Except Tobin's *q*

Year	2006		2007		2008		2009		2010		Average
Airline Company	MV of Equity	Tobin's q	MV of Equity	Tobin's q	MV of Equity	Tobin's q	MV of Equity	Tobin's q	MV of Equity	Tobin's q	Tobin's q
American Airlines	6,897.42	1.038	3,582.40	0.8004	3,039.76	1.0224	2,617.10	1.0008	2,643.85	1.0137	0.9751
Airtran	1,070.22	0.5114	657.9	0.5411	530.8	0.5922	703.27	0.456	1,002.40	0.4499	0.5101
Alaska	1,678.80	0.8199	1,070.98	0.7109	1,262.76	0.823	1,238.74	0.7554	2,098.10	0.8756	0.797
Unied Continental Holdings	8,435.75	1.0039	3,899.32	0.8195	1,543.22	0.9684	2,163.85	1.0183	7,811.12	0.8612	0.9343
Delta	2,697.79	1.565	4,459.03	0.6721	8,052.77	0.9703	9,045.66	1.026	10,681.23	1.0647	1.0596
Frontier (Republic Airways)	716,652.71	0.9901	713,224.34	1.0277	367,567.45	0.868	255,338.28	0.8266	352,604.40	0.7957	0.9016
Hawaiian Airlines	228,261.18	0.8978	240,929.61	0.8291	328,677.36	0.9788	360,354.77	0.7676	393,731.68	0.7205	0.8388
JetBlue	2,522.05	1.1384	1,071.40	0.8116	1,929.52	0.9554	1,588.62	0.779	1,947.88	0.8457	0.906
SouthWest	12,275.70	1.2531	9,788.25	0.9203	6,929.31	0.9501	9,214.85	1.0437	10,474.72	1.013	1.0361
US Airways	4,915.64	1.1075	1,351.33	0.6038	882.1	0.8834	779.74	0.87	1,620.37	0.854	0.8637
Allegiant Air	547,357.55	1.749	656,784.72	1.5626	973,455.46	2.2551	922,632.18	1.7033	935,846.63	1.862	1.8264
Skywest Inc.	1,738,393.20	0.8794	1,877,643.99	0.8815	1,333,658.10	0.7364	1,245,518.96	0.7052	1,172,310.14	0.66	0.7725
Great Lakes Airlines	31,943,371.90	1.2998	32,411,531.00	1.0274	21,437,955.00	1.3187	20,008,758.00	0.7303	24,296,349.00	0.7004	1.0153

3.9 Standard Accounting Measures

A number of accounting performance measures have been used to compare with results measured through the Tobin's *q* formula. As accounting measures are based on historic data and Tobin's *q* looks into the future, a comparison between them would provide a great deal of information regarding the relevance and the linkages between them.

We select three different measures which are Return on Assets (ROA), Return on Equity (ROE) and Earning per Share (EPS). These three accounting measures are given as;

ROE = Net Income/ Total Equity

ROA = Net Income/ Total Assets

EPS = Net Income available for distribution/Total outstanding Common Shares

Net income is taken to be the net profit after corporate tax while total equity includes equity attributed to the common stockholders and total assets measured as total current and non-current assets as at the end of the reporting period.

3.10 Dependent Variables

In our study we have mainly four dependent variables. The First and the foremost is the Tobin's *q* which measures the firm value. For measuring accounting performance we have three variables which are Return on Asset, Return on Equity and Earnings per Share.

3.11 Independent Variables

The main independent variable which has been used in the regression analysis is the percentage hedged at the year-end for the next year's fuel cost. Considering only hedging with the Tobin's *q* would be meaningless as there are other variable which may be affecting the firm value. So in order to accurately measure the one to one relationship between hedging and Tobin's *q*, certain variables should be controlled. We use the same controlling variables as used in Allayannis and Weston (2001) except one variable which is "liquidity". Allayannis and Weston (2001) did not use this variable but concerning the situation of airline industries after different economic changes this variable is highly relevant. The same variables have been used for the analysis of accounting performance to ensure logical comparison with the widely used Tobin's *q* methodology. All the independent variables used are as follows:

3.11.1 Firm Size

Size has remained controversial as previous researches show contradicting results on size and firm value. However, it qualifies for a control variables as large firms are more likely to hedge than smaller firms due to their better resources, improved knowledge and having proper risk management departments. Bodnar *et al* (1998) and Hagelin (2003) show the positive relationship between size and hedging. We have taken log of total assets as a proxy for firm size. The more the size of the firm the accounting performance is expected to be better because larger sizes relates to the economies of scale, which reduces costs per unit thus reducing the operating expenses of the firm. This reduction ultimately affects net income which positively affects accounting measures like ROA, ROE and EPS.

3.11.2 Liquidity

Cash constrained firms are more likely to invest in positive NPV projects according to Jensen (1986). So firms that have less liquidity have more chances to have higher Tobin's *q* value because of the free cash flow argument. We have used current ratio as a proxy for firm liquidity. Therefore, liquidity is expected to have a negative influence on firm value. However, higher liquidity is expected to have positive affect on accounting performance because higher liquidity allows the firm to invest more generating more revenues, irrespective of the value it generates. These higher revenues lead to higher incomes thus having a positive impact on accounting measures.

This variable is not used in the Allayannis and Weston (2001) but used in the research of Pramborg (2003). This is an important variable because during our research period most firms had lower liquidity. Out of 65 firm year observations only 9 observations are those in which liquidity was higher. This shows that most of the firms had lower liquidity which may affect firm value. So this variable needs to be controlled.

3.11.3 Leverage

We expect a positive relationship between leverage and firm value because higher leverage may cause the management to be more efficient and furthermore leverage increase the tax benefits of debt according to Jensen (1986). However, according to Fama French (1998) and Allayannis and Weston (2001) negative relationship exists between leverage and *q* value. So to control this affect debt to total asset ratio is taken as a proxy for leverage. The total short and long term debt is taken to get accurate results.

On the accounting aspect of our research, higher leverage is taken to be positively correlated to our accounting dependent variables due to the fact that higher leverage induces firms to invest more to generate the required returns which affect the firm's net income. Moreover, firms try to become efficient to cover interest payment costs so as to avoid defaulting on their loans and end up violating debts covenants.

3.11.4 Profitability

Profitable firms are more likely to have higher firm value so this is an important variable to control. Return on Asset is used as a proxy because the firm value is based on how well the assets can be utilized to produce higher per dollar returns. We expect a positive coefficient on this variable. Again the higher the profitability the higher would be the accounting variables as they are directly based on income and profit figures. So we expect a positive relationship between our dependent accounting variables and the independent variables.

3.11.5 Investment Opportunities

Based on the Allayannis and Weston (2001) approach we have taken Capital expenditure over sales as measure for investment opportunities. Froot *et al* (1993) and Geczy *et al* (1997) show that firms hedging is positively related to investment opportunities i.e. higher the hedging the more the investment opportunities so we expect a positive relations between them.

The same relationship exists for the accounting measures because higher investment opportunities are reflected into the sales and revenue figures which are accounting figures. Therefore, accounting figures are dependent on sales and income levels which have a positive relationship with investment opportunities.

3.11.6 Dividends

If hedgers have limited access to financial markets it may cause their Tobin's *q* to have higher values. This is because limited financial access will motivate the companies to undertake only projects with higher Net Present Value (NPV). To account for this we have taken dividends as a proxy. Dividend would be treated as dummy variable equal to one if dividend is paid otherwise zero. The rationale behind is that firms paying dividends are less likely to face financial constraint as they can increase their investment spending by reducing their dividends refer to Fazzari, Hubbard and Petersen (1988). So we expect a negative relationship

between dividends paid and firm value as higher dividends may cause a company to over invest and pursue negative NPV projects.

It is important to note that dividends have no relation with ROA, ROE and EPS because these dividends do not affect the net income values as they are accounted after net income has been calculated.

Other control variables such as industrial and geographic diversification used in Allayannis and Weston (2001) are not included as almost all airlines operate in one segment and have no industrial diversification. The operations are similar. Moreover, geographic diversification is also not a correct measure because of the fact that our report is based on large listed U.S. airlines that have operations in different geographic areas. So adding geographic diversification would distort the results as no distinction can be made between the companies. This variable is not considered to be important. The *Figure 5* in the next page summarizes the above information with expected coefficient signs.

Figure: 5
Expected Regression Coefficients

Dependent Variable → Tobin's *q* Independent Variables	Expected Sign
Percentage Hedged	+
Firm size (Ln Assets)	+
Liquidity (Current ratio)	-
Leverage (debt to asset)	+
Inv. Opp (Capex/Sales)	+
Profitability (ROA)	+
Dividends (dummy)	-

Dependent Variable → ROA Independent Variables	Expected Sign
Percentage Hedged	+
Firm size (Ln Assets)	+
Liquidity (Current ratio)	+
Leverage (debt to asset)	+
Inv. Opp (Capex/Sales)	+
Dividends (dummy)	**N/A**

Dependent Variable → ROE Independent Variables	Expected Sign
Percentage Hedged	+
Firm size (Ln Assets)	+
Liquidity (Current ratio)	+
Leverage (debt to asset)	+
Inv. Opp (Capex/Sales)	+
Profitability (ROA)	+
Dividends (dummy)	**N/A**

Dependent Variable → EPS Independent Variables	Expected Sign
Percentage Hedged	+
Firm size (Ln Assets)	+
Liquidity (Current ratio)	+
Leverage (debt to asset)	+
Inv. Opp (Capex/Sales)	+
Profitability (ROA)	+
Dividends (dummy)	**N/A**

4. REGRESSION MODEL

4.1 Regression Analysis

4.1.1 Nature of data

The data we have used is panel data as it has both cross sectional and time series dimension. As a subject *e.g.* airline is studied on different basis like leverage, size over a period of years so this makes it a panel data. Panel data is attractive because it offers solution to the bias caused by unobserved heterogeneity as mentioned by Baltagi (1995) and it reveals dynamics that are difficult to detect in cross sectional data.

4.1.2 Choice of Regression Model

For panel data the models that fit are fixed effects regression and random effects regression. As there are some variables which are unobservable and have to be controlled so we recommend a fixed effects model in which these variables are constant over time but differ among subject *i.e.* airline. Moreover, we can control them without even measuring them which simplifies the process. Further to see, whether our choice of fixed effect is accurate and whether there are significant fixed effects we carried out the "Redundant Fixed Effects Test". The result of the test is shown below:

Effects Test	Statistic	d.f.	Prob.
Cross-section F	9.2254	(12,45)	0.000

The results in the table above show a high f- statistic value and a low probability showing significant fixed effects. So the choice of fixed effects model is appropriate in our research.

4.1.3 Regression Equation

The general panel data regression model is narrated in the equation *(ii)* as follows:

$$y_{it} = \alpha + \beta' X_{it} + u_{it} \qquad (ii)$$

Whereby; u_{it} represents time invariant fixed effects.

The equation *(iii)* is derived after running our model including the dependent and explanatory variables is as follows:

$$LNTOBINSQ = C(1) + C(2)*PC\_HEDGED + C(3)*CR + C(4)*DIVIDEND + C(5)*DTA + C(6)*LNTA + C(7)*CAPEXSALES + C(8)*ROA + [CX=F] \qquad (iii)$$

4.2 Methodological Issues

We have chosen the period 2006 to 2010 to determine the effect of hedging on U.S. airline industry as we are trying to update the results of previous research. Period before 2006 have already been tested and a replication of it would not be adding value to existing research studies. Moreover, going further before 2006 would distort the results due to the presence of the affects of September 11 attacks in the U.S. which really affected the U.S. airline industry for few years. This would add outliers to the data which would make the research results different from that would be under normal conditions.

4.2.1 Validity

Validity is an important measure to check the strength of our conclusion, inferences or proposition. According to Cook and Campbell (1979) validity is the "best available approximation to the truth or falsity of a given inference, conclusion or proposition". The internal validity of our research is strong as both the Tobin's *q* and hedging have a causal relationship with each other. As hedging affects the firm value as it results in higher market valuation by the investors especially when earnings are highly variable. It can also be opposite in the sense that hedging incurs cost and is not valued by investors. We ensured internal validity by adding control variables in our research which would make sure that any change in Tobin's *q* is due to hedging.

The external validity means that the method and results are applicable in other settings as well *e.g.* for European Airlines. This validity has been strong in our case as we used Tobin's *q* measure which can be applied to any industry be it oil and gas as showed by Jin and Jorion (2006), in airlines as proved by Carter, Rogers and Simkins (2003, 2006) or other commercial corporations according to Pramborg (2003). The results of all the previous researches mentioned according to my knowledge and mentioned in this report were similar that hedging creates value except in one study which is Jin and Jorion (2006) that hedging is not value creating. Therefore, we can observe that there is consistency between the results and method used in this area of study even in different studies at different times. Hence, validity is not serious matter in our research as evidences of strong validity are present.

4.2.2 Reliability

Reliability means the consistency of the results or observations at different times. As our analysis is a quantitative analysis which is measured through *E-Views 7* the results would be similar if we enter the same input information *i.e.* the variables and use the same assumptions. The reliability of the data has been seen by checking the SEC filings published in the company websites and the one's published in the SEC website. We have not used annual reports from the website which are not 10-k filings as such reports normally differ from the 10-k filings registered with the SEC. So data consistency has been ensured at all levels as we incorporated the most reliable source of information (SEC filings) into our study which is the same in all web sources.

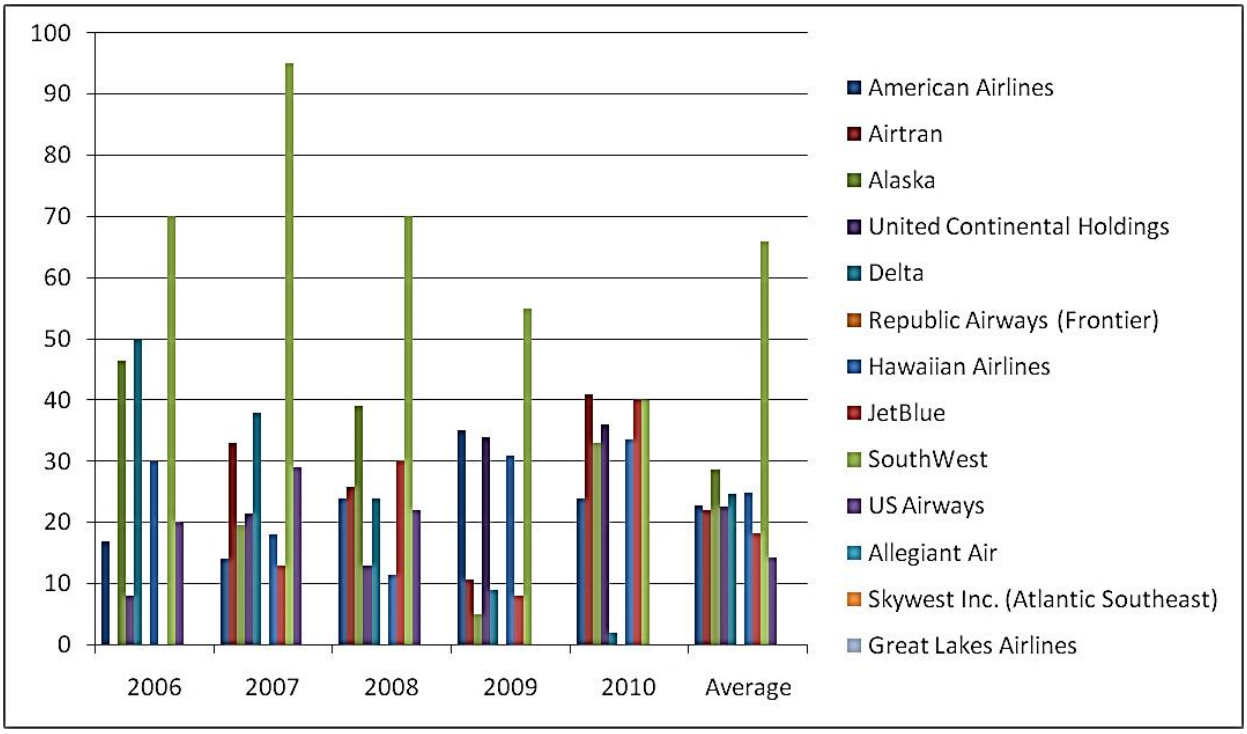
The test/retest method can be used to see the reliability of our methodology. Moreover, our study is formula (Tobin's *q*) and equation based (regression), the output should be the as long as the same inputs are used.

5. RESEARCH FINDINGS AND ANALYSIS

5.1 Industrial Study

Figure: 6

Percentage Fuel Operating Expenses Hedged for US Selected Airlines 2006-2010

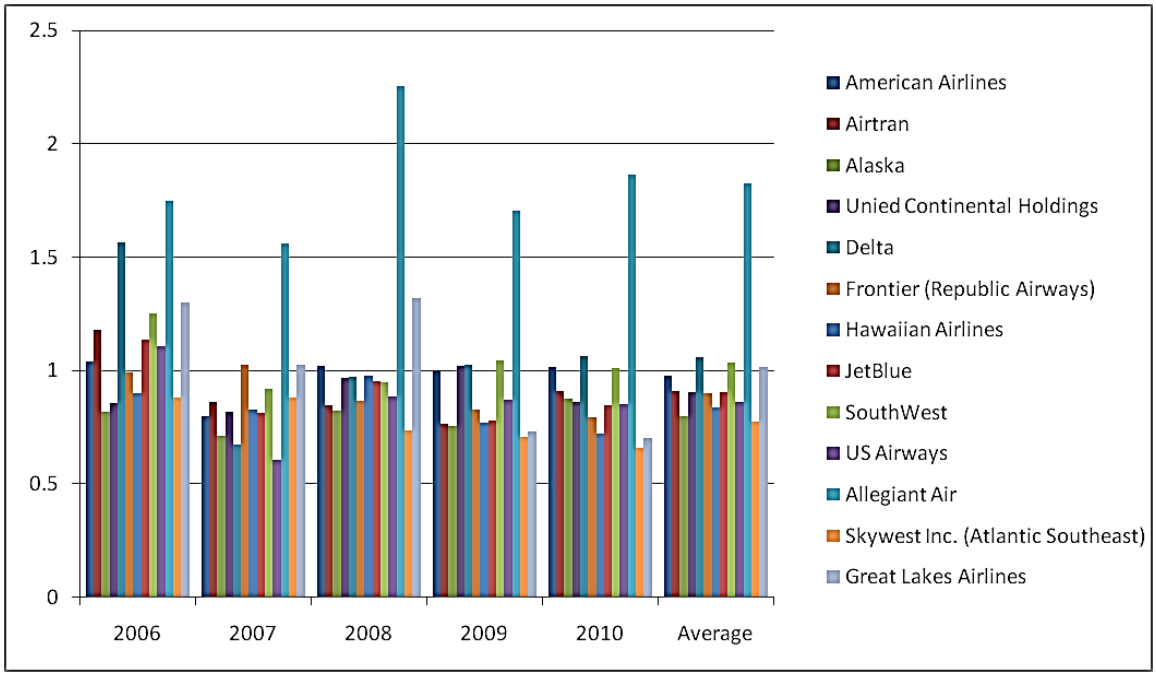


The *Figure 6* above shows that, out of 13 airlines 9 hedged throughout the period except AirTran which did not hedge in 2006. Southwest airline is the airline that hedged in the entire period from 2006 to 2010 and has reached the maximum of hedging in the year 2007 which is about 95%. There were four airlines which did not hedge at all, namely Great Lakes, Allegiant, SkyWest and Republic Airways. The average hedged ratio remained stable for the majority of the companies ranging between 20% - 30%, except the US Airways, Jet Blue and Southwest. Southwest had an extremely high average hedged percentage crossing 60% because of its higher hedge ratio during the period. Southwest airline has proven to be the highest hedger of next year's fuel consumption. This is due to the fact that it is the third largest carrier based on number of passenger transportation in U.S and it hedges all types of fuel used in operations such as crude oil, heating oil and unleaded gasoline. Overall the hedging percentage is highly fluctuating

among all the companies throughout the period *e.g.* SouthWest increased hedging in 2007 but in 2008 it reduced its percentage. All is dependent upon the fuel requirements of the following year and the management's decision to hedge keeping in mind all the external factors such as hikes, economic policy and supply considerations.

The next *figure* explains the results of the Tobin's *q* with the help of a graphical illustration.

Figure: 7
Tobin's q Summary



The major findings that can be derived from the above trend is that most of the companies and Tobin's *q* value as measured using the formula described earlier is below 1 in all the years. However, Allegiant Air is an exception. During the entire period the Tobin's *q* value of Allegiant Air was above 1.5 which can be an outlier in this case and may cause distorted results but this can be offset by the extreme lower Tobin's *q* value of AirTran which has remained below 0.6 throughout the study period. The most striking result is in 2008 when it crossed *q* value of 2. Delta airline also has one similar observation in year 2006 but after that situation seems to be normalized. The main reason of higher values of Allegiant Air is that as it is a smaller airline it has lower value of

assets (denominator of Tobin's *q*) or higher market value (numerator of Tobin's *q*) which has made its Tobin's *q* very high. Moreover, the share price of Allegiant is very high and had an increasing trend as compared to its competitors reaching $49/share in 2010. All these factors contributed to an abnormal Tobin's *q* value for the Allegiant Air.

Figure: 8
Correlation Analysis

Variables	LNTOBINSQ	PC_HEDGED	LNTA	DTA	DIVIDEND	CR	ROA	CAPEX SALES
LNTOBINSQ	1							
PC_HEDGED	(0.12)	1						
LNTA	(0.25)	0.48	1					
DTA	(0.14)	0.38	0.59	1				
DIVIDEND	0.00	0.10	0.11	(0.45)	1			
CR	0.00	(0.36)	(0.23)	(0.65)	0.58	1		
ROA	0.05	(0.22)	(0.49)	(0.55)	0.14	0.27	1	
CAPEXSALES	0.05	0.06	0.30	0.24	(0.08)	(0.14)	(0.11)	1

This table shows the correlation among different variables used in the regression analysis. It also shows multi co-linearity among the variables used.

The above correlations depict the relatedness of different variables. Highly correlated variables are said to be similar and can distort the results. This multi co-linearity makes it hard to distinguish or to figure out the exact coefficient or the magnitude effect of any explanatory variables on the dependent variable. Highly related explanatory variables affecting the dependent variable would be similar because of their high correlation. So the actual inferences may be distorted in the case of multi co-linearity being present amongst any explanatory variables. Moreover this will result in higher standard errors and bring instability in the coefficient estimates.

In this study it can be seen that most of the variables having a correlation below a level that does not indicate multi co-linearity. This was based on Kennedy *et al* (2003) that suggested a value as high as 0.8 and 0.9 in the correlation matrix indicates high correlation amongst the explanatory variables. Since all the explanatory variables are well

below that level in this study so it can be assumed that there is no multi co-linearity amongst them.

Figure: 9

Estimation of the Relationship between Volatility and Hedging Behavior into Firm's Value

	2006 – 2010		
Variable	**Coefficient**		**P-Value**
Constant	7.1489	***	0.0000
PC_HEDGED	0.2226	*	0.0943
LNTA	(0.3408)	***	0.0000
CR	0.0294		0.8054
DTA	0.2988	**	0.0204
DIVIDEND	0.1538		0.3027
CAPEXSALES	0.0659		0.6902
ROA	0.0507		0.8279
R^2 – Adj			0.6412
P -Value, F-Stat			0.0000
# Observations			65

This table reports the results of the regression estimation of variables including hedging behavior into the natural logarithm of Tobin's q (lntobin's *q*) as a dependent variable. One regression is run for the period of 2006/2010 using Panel EGLS (Using Cross-section Weights) of a sample of 13 airlines and 65 Observations. Statistical significances at the level of 10%, 5%, 1% level is indicated by *, **, and *** respectively.

PC_HEDGED is percentage hedged of next year's fuel requirements which measures hedging. LNTA is natural logarithm of total assets to control for size. CR is current ratio to control for liquidity. DTA is debt to total asset ratio to control for leverage. DIVIDEND is dummy variable. CAPEXSALES is capital expenditure over sales to control for investment opportunities. ROA is Return on Assets as a control variable for profitability.

Consistent with the results of Carter *et al* (2006) and Allayannis and Weston (2001) our results show a positive and significant relation of hedging with firm value at 10% significance level. This reveals that the greater the next year's fuel requirements are hedged the higher the firm value. The firm who hedges 100% of its next year requirements would contribute 22.22% premium to its value as compared to those who do not hedge. The hedging premium is higher than 5% as measured in Allayannis and Weston (2001) and 10.2% of Carter *et al* (2006). An explanation for this higher value as compared to Carter *et al* (2006) is due to the fact the fuel prices today constitute a larger

part of the operating cost, see *Figure 10* below, both because of higher fuel cost and higher fuel requirements. Higher fuel cost is attributed to the demand and supply factors and higher fuel requirements are because of the airline's more demand for fuel because of extended routes and more coverage. The higher value premium in our study is maybe because of the changes in "Market value of Equity" (MVE) in the Tobin's *q* formula, as today's world is full of uncertainty which motivates investors to put higher value on firms who hedge their price risk. Furthermore, as fuel prices fluctuate a lot, so investors cannot hedge themselves and do not have the required information which makes hedging more valuable if it is performed by the company itself.

Figure: 10

Fuel Cost Trend as % of Total Operating Cost in US Airline Industry

Period	Fuel Cost as % of Total Operating Cost
1970s	16.3
1980s	20.7
1990s	12.2
2000s	19
Average %	17
2010	24.6

Sources: ATA, http://www.airlines.org/Energy/FuelCost/Pages_Admin/FuelCost.aspx, Accessed on May 17, 2011 at 1357 hrs.

In addition to the main hedging variable, other variables which are control variables would now be discussed in relation to the dependent variable. Using Tobin's *q* as the dependent variable the results are similar to the past studies. First the estimate of size as measured by natural logarithm of total assets is highly negative and highly significant showing that larger size does not provide an advantage to the firm value. This is consistent with the finding of Allayannis and Weston (2001) and Lang and Stulz (1994)

on size but is different from what we expected according to Nance *et al* (1993) and Mian (1996). The actual result is different from the expected because bigger size can also lead to inefficiency and higher hedging costs which reduces firm value. The leverage measure which is debt to total asset (DTA) is positively correlated with firm value and is significant. This is consistent with the fact that more leverage causes higher firm value due to the tax benefits according to Graham (2000), monitoring effects of debt and managerial efficiency according to Ross (1977). Leverage is similar to our expectations.

The insignificant variables are the liquidity which is measured by current ratio, profitability as measured by return on assets, investment opportunities measured by capital expenditure over sales and dividend. The insignificance of liquidity and dividend dummy is similar to the results achieved by Pramborg (2003) who studied the effects of derivative hedging on firm value in Swedish firms. Return on Assets and investment opportunities provide different results from past studies which can be explained through the concept of reverse causality. In previous studies the significant positive relationship between firm value and investment opportunities and profitability was maybe because higher firm value creates more incentives of higher investment opportunities and higher profitability rather than the opposite. Other reasons can be due to the fact that also Allayannis and Weston (2001) results were significant because they used the pooled regression method in contrast with the panel method we used. Dividends have a positive coefficient in our study which is similar to the results of Carter *et al* (2003, 2006) but in contrast with the negative sign of Allayannis and Weston (2001). As the Carter (2003 and 2006) studies were based on airline industry resembling our sample, it can be explained as a reason for the different result between Allayannis and Weston (2001) and our study. The significance of dummy variable in our study matches with Carter *et al* (2006) as it uses the fixed effects model whereas; Carter *et al* (2003) used FGLS methodology and pooled regression without the fixed effects. It can be argued that our dividend results may be different from other studies because of the type of method followed in the regression.

5.3 Our study results vs. earlier research

The *figure* below provides a brief overview of the results of this study with the previous studies so that major similarities and differences can be identified with a quick glance.

Figure: 11
Study Results

Variables	Our Study	Allayannis and Weston(2001)	Carter et al (2003)	Carter et al (2006)
Hedging	+ significant	+ significant	+ significant	+significant
Firm Size	- significant	- significant	- significant	- significant
Leverage	+ insignificant	+ significant	- insignificant	+ significant
Liquidity	+ insignificant	N/A	N/A	N/A
Profitability	+ insignificant	+ significant	+ insignificant	+ insignificant
Investment Opportunities	+ insignificant	+ significant	+ insignificant	+insignificant
Dividend	+ insignificant	- significant	+ significant	+ insignificant

5.4 Accounting Performance

As accounting ratios are historic on nature as they are based on the historic data of income statement and balance sheet, we will analyze whether hedging has any effects on historic measures of performance as value measure. The higher the Return on Assets, Return on Equity and Earnings per share of a firm the higher the investors place value on the firm as they seem to be more profitable, generating higher returns and thus creating more shareholder wealth.

The regression results of accounting performance will be presented and discussed on the *figures* in the next page. It will show the coefficient size and sign of independent variables with respect to the dependent variable which are the accounting ratios such as EPS, ROA and ROE.

Figure: 12
EPS as Dependent Variable

Variable	Coefficient		2006 – 2010 P-Value
Constant	0.0152		0.9997
PC_HEDGED	(4.9412)	***	0.0001
DTA	(4.3364)	***	0.0033
CR	(1.7570)	***	0.0002
LNTA	0.2046		0.8919
CAPEXSALES	0.4883		0.9023
ROA	84.3975	***	0.0000
# Observations			65

The table above represents the regression results of the Dependent Variable Earning Per Share (EPS) to the Independent variables to the firm. One regression is run for the period of 2006/2010 using Panel EGLS (Using Cross-section Weights) of a sample of 13 airlines and 65 Observations. Statistical significances at the level of 10%, 5%, 1% level is indicated by *, **, and *** respectively.

Figure: 13
ROA as Dependent Variable

Variable	Coefficient		2006 – 2010 P-Value
Constant	(4.0963)	***	0.0000
PC_HEDGED	0.0218		0.6169
CR	0.0456		0.1106
DTA	(0.0467)	*	0.0981
LNTA	0.1839	***	0.0000
CAPEXSALES	0.1082	*	0.0627
# Observations			65

The table above represents the regression results of the Dependent Variable Return on Assets (ROA) to the Independent variables to the firm. One regression is run for the period of 2006/2010 using Panel EGLS (Using Cross-section Weights) of a sample of 13 airlines and 65 Observations. Statistical significances at the level of 10%, 5%, 1% level is indicated by *, **, and *** respectively.

Figure: 14
ROE as Dependent Variable

Variable	Coefficient		2006 – 2010 P-Value
Constant	5.6466		0.5961
PC_HEDGED	0.1257		0.6666
DTA	(0.7044)	***	0.0005
CR	0.0981		0.7431
LNTA	(0.2381)		0.6043
CAPEXSALES	(0.1584)		0.8478
ROA	(0.4250)		0.8061
# Observations			65

The table above represents the regression results of the Dependent Variable Return on Equity (ROE) to the Independent variables to the firm. One regression is run for the period of 2006/2010 using Panel EGLS (Using Cross-section Weights) of a sample of 13 airlines and 65 Observations. Statistical significances at the level of 10%, 5%, 1% level is indicated by *, **, and *** respectively.

The results show that, hedging is highly significant in the case of earnings per share according to *Figure 12*. But contradictory to our expectation and results of one study Weiying and Jian (2010), our study has a significant negative effect on EPS with a coefficient reaching 5. The major reason of this negative relationship is due to the fact that cost of hedging is accounted in the income statement under the headings of "Operating Expenses" [7] in the section of "fuel and oil" and under the "Other Expenses" in which "other gains and losses" account for this. Premium paid for hedge contracts are recorded in "other gains and losses" [8] and the change in the market value of contracts due to change in fuel prices is recorded in "fuel and oi*l*" [9] category for effective settled hedges[10] that qualify for hedge accounting[11]. Those that do not qualify for hedge accounting *i.e*. those where energy prices are highly volatile the changes in value are charged to "*other gains and losses*" As both of these costs "*fuel and oil*" and "other gains and losses" constitute most of the airline's cost, these values are highly affected by the amount of hedging undertaken. Therefore, the higher the extent of hedging, the higher

[7] Included in Item No.8 in the Statement of Operations of SEC filings of the airline companies
[8] *ibid*
[9] *ibid*
[10] Those which qualify for hedge accounting and are charged in "fuel and oil" category
[11] It determines how a financial derivative is measured after its recognition and where the changes in fair value are to be reported in the income statement or balance sheet.

these costs will be and which in turn will reduce the net income available to shareholders. Keeping this view in mind the higher extent of hedging relates to higher a premium, settlement and market value loss which reduces the EPS and hence, EPS is negatively associated with the extent of hedging. Further to this evidence, the results of Weiying and Jian (2010) was based on non-financial firms with a sample size of more than 1000 firms which makes its results less applicable to our study which is based on the airline industry. The significant negative relationship of leverage and liquidity with EPS is inconsistent with our expectations. This holds because higher leverage and liquidity will raise the chances of financial distress and selecting negative NPV investments which incurs costs for the company. ROA on the other hand is consistent with our expected results as both of these are based on net income figures so the higher the ROA the higher would be the EPS. It should be noted that the coefficient is very high reaching up to 84 showing strong correlation.

The same goes for the dependent variable ROA refer to *Figure 13*. Firm size gives the results similar to what we expected but leverage, on the other hand is inconsistent with our positive expectation. This is due to the fact that as airline is a capital intensive industry, higher leverage may cause a larger proportionate increase in assets as compared to the increase in income, hence reducing firm value and increasing the breakeven point. Liquidity is in contrast with what we find in the regression result of EPS. Here the liquidity is different from our expectation and shows a positive relationship with measure of firm value which is ROA. This can be because of the fact that lower liquidity causes firms to reject some positive NPV projects according to Jensen (1986). This is also in accordance with our expectations.

In measuring ROE according to *Figure 14* as a measure of firm value we see that hedging has no effect on value and the only significant results is with its relation to leverage. The result on leverage is in accordance with what we got in the analysis of ROA and EPS with respect to coefficient sign but the results are different from what we expected in the beginning. This is because higher leverage may cause interest payments on debt, leaving less for distribution to the equity holders. Other independent variables are insignificant in the analysis and hence, require no further explanation.

6. CONCLUSION

The U.S airline industry provides a strong foundation to test whether the extent of hedging relates to firm value and to what extent accounting performance variables act as an alternative measure of firm value. This is due to the fact that the variation of hedging in firms in U.S. airline industry starting from US Airways who on average hedged 11.4% of their next year's fuel requirements, and going to SouthWest whose average hedge was 63.4%. This variation will be able to accurately measure the extent of hedging and to answer whether higher hedging creates more value using both Tobin's *q* and accounting measures.

Our study finds that airlines employing jet fuel hedging trade at a premium and a 100% fuel hedging cause 22.2% increase in firm value as measured with Tobin's *q*. The result is consistent with the findings of Allayannis and Weston (2001) that hedging adds value. Moreover, it suggests that the contradictory results of Jin and Jorion (2006) maybe due to their choice of the sample. Guay and Kothari (2003) questions the validity of the results produced by Allayannis and Weston (2001), while our research gives a clearer picture and significant finding that hedging adds value because of the reduction of fuel price exposure. Based on the value premium of hedging which is approximately 12.2% higher than earlier studies mainly Cater *et al* (2003) airlines should hedge more of their fuel price risk to have a positive effect on the firm value. This is because of the fact that fuel costs today are a larger proportion of total cost of airline companies. Our results are robust to various controls such as size, leverage, dividends, investment opportunities and profitability, and also the different regression control to check for heteroskedasticity and outliers.

With the dual aim of adding to previous researches and bringing in something new to this field we investigated hedging against accounting measures of ROA, ROE and EPS as measures for value. As these measures are based on historic data it is good to see whether both the futuristic approach (Tobin's *q*) and historic approach (accounting measures) coincide while finding value effects of hedging on airlines. We find that the results are not complementary to each other in the two approaches of firm value, one indicating higher Tobin's *q* value through hedging and the other supporting no and even negative

relationship between accounting performance and hedging. The results are highly significant when EPS is the value measure and shows a negative relationship between hedging and EPS showing higher hedging will lead to lower EPS. Hedging is insignificant in explaining changes in other firm value accounting measures like ROA and ROE. The measures for robustness have been the same as used in the Tobin's *q* with same control variables. As to our knowledge there is no study on accounting performance with respect to firm value in the airline sector so we are unable to compare the results.

6.1 Future research opportunities

As we mentioned earlier that there is a lack of availability of research on hedging and the accounting performance so our research can open new avenues for researchers in risk management to look into different perspectives. This can be done by applying the same research in different industries like Oil and gas, commercial listed corporations which can give a larger sample size and thus more accurate results. Few more variables can be added to the accounting performance firm value measures which are more correlated with Tobin's *q* like Price to Book Value Ratio. This is ratio of market price to book value per share. This ratio is a combination of both historic and future values as market price is based on the expectations of the investors. So such accounting variables can explain value affects due to hedging in a more comprehensive way. Moreover, this ratio can provide an indication of the existence of undervalued assets and thus the firm's potential by holding a double relationship between market and book values. Furthermore, value can be measured as EVA (Economic Value Added) and MVA (Market Value Added) approach and its correlation with the *q* value can be estimated. It remains to be seen that whether EVA or MVA can produce a less divergent explanation of airline performance in comparison to the *q* value.

Future research would help in producing more comparable studies in the airline sector and thus will open more room for additional researches. New variables can be added and the control variables can be changed which would increase the database of empirical evidence in the airline industry which at the present moment is very minimal.

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8. APPENDIX

Exhibit 1: U.S Consumption of Total Energy by End Use Sector 1973-2009

Year	Transportation	Percentage transportation of total	Industrial	Commercial	Residential	Total[a]
1973	18.6	24.6%	32.7	9.5	14.9	75.7
1974	18.1	24.5%	31.8	9.4	14.7	74.0
1975	18.2	25.3%	29.4	9.5	14.8	72.0
1976	19.1	25.1%	31.4	10.0	15.4	76.0
1977	19.8	25.4%	32.3	10.2	15.7	78.0
1978	20.6	25.8%	32.7	10.5	16.2	80.0
1979	20.5	25.3%	34.0	10.6	15.8	80.9
1980	19.7	25.2%	32.1	10.6	15.8	78.1
1981	19.5	25.6%	30.8	10.6	15.4	76.3
1982	19.1	26.1%	27.7	10.9	15.6	73.3
1983	19.2	26.2%	27.5	11.0	15.5	73.1
1984	19.9	25.9%	29.6	11.5	15.8	76.7
1985	20.1	26.3%	28.9	11.5	16.1	76.5
1986	20.9	27.2%	28.4	11.5	15.9	76.8
1987	21.5	27.2%	29.5	12.0	16.2	79.2
1988	21.4	25.8%	30.8	12.6	17.1	82.8
1989	22.6	26.6%	31.4	13.2	17.8	85.0
1990	22.4	26.5%	31.9	13.4	17.0	84.7
1991	22.2	26.2%	31.5	13.5	17.1	84.6
1992	22.5	26.2%	32.7	13.4	17.4	86.0
1993	22.9	26.1%	36.7	13.8	18.3	87.6
1994	23.5	26.3%	33.6	14.1	18.1	89.3
1995	23.8	26.2%	34.0	14.7	18.5	91.2
1996	24.4	25.9%	35.0	15.2	19.5	94.2
1997	24.7	26.1%	35.3	15.7	19.0	94.8
1998	25.3	26.8%	34.9	16.0	19.0	95.2
1999	25.9	26.8%	34.9	16.4	19.6	96.8
2000	26.5	26.8%	34.8	17.2	20.4	99.0
2001	26.3	27.3%	32.8	17.2	20.1	96.3
2002	26.8	27.4%	32.8	17.4	20.8	97.9
2003	27.0	27.5%	32.6	17.4	21.1	98.2
2004	27.9	27.8%	33.6	17.7	21.1	100.4
2005	28.4	28.2%	32.5	17.9	21.7	100.5
2006	28.8	28.9%	32.5	17.8	20.7	99.9
2007	29.1	28.7%	32.6	18.3	21.6	101.6
2008	29.0	29.2%	31.4	18.4	21.6	99.6
2009	27.0	27.1%	28.2	18.1	21.2	99.6
Average annual percentage change						
1973–2009	1.0%		-0.4%	1.8%	1.0%	0.8%
1999–2009	0.4%		-2.1%	1.0%	0.8%	0.3%

Source:

U .S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, *April 2010*, Washington, DC, Table 2.1. (Additional resources: www.eia.doe.gov)

Exhibit 2: Descriptive Statistics for applied variables 2006-2010

	TOBINSQ	LNTOBINSQ	CAPEXSALES	CR	DTA	LNTA	PC_HEDGED
Mean (μ)	0.95	(0.05)	0.13	1.18	0.70	22.11	0.24
Median	0.88	(0.13)	0.06	1.02	0.80	22.30	0.25
Maximum	2.26	0.81	0.87	3.16	1.69	24.53	0.95
Minimum	0.60	(0.50)	(0.09)	0.59	0.00	18.23	0.00
Std. Dev.(σ)	1.30	0.26	0.21	0.56	0.38	1.69	0.22

Presented is the table above is the averages of the dependent and independent variables applied in the analysis for the period of study (*i.e.* 2006 to 2010) where LNTOBINSQ = natural log of Tobin's *q*, capexsales; proportion of capital expenditure to sales, CR; current ratio, DTA; Total debt to total assets and PC_HEDGED; percentage of fuel expenses out of total operating expenses hedged.

Source: Computed from SEC Fillings: http://www.sec.gov/edgar/searchedgar/companysearch.html

Exhibit 3: Heteroskedasticity Representation