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OIL, OIL VOLATILITY AND AIRLINE STOCKS: A GLOBAL ANALYSIS

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ABSTRACT

By selecting a globally representative dataset of airline indices, this study demonstrates that oil price or oil price regimes (delineated by the first gulf war and the 9/11 terror attacks) alone do not have any significant implications for airline stock prices. Overall, these findings are contrary to the general perception that higher oil prices or oil volatility are bad news for the airlines industry. Perhaps airlines are in a better position to estimate their oil risk and take hedging positions as appropriate. However, airlines stocks appear to be significantly prone to the combined effects of oil volatility and oil regimes determined by the globally significant events/ shocks.

Oil price, oil volatility, airlines, gulf war, 9/11 attacks

JEL codes: G15, Q43

INTRODUCTION

There is a widely held belief in the financial media that higher oil prices have an adverse impact on equity markets, and particularly on airline profitability and shares. For instance, news headlines such as 'NWA stock sinks on oil-price surge'[1], 'Airline industry optimism sapped by surging oil prices'[2], and 'Airline shares surge as oil slips'[3], are indicative of this belief. Singapore Airlines[4] reported quarter (July-September, 2008) profit being 36 percent lower blaming fuel costs for increased expenditures. Dubai-based airline Emirates[5] reported an 88 percent fall in net profit compared in the same period and blamed steep fuel prices for dragging its profit down sharply in the six months through September, 2008. Emirate's Chairman and Chief Executive (Sheik Ahmed bin Saeed al-Maktoum) said, "The first half of the year has been very tough for the airline industry, with record fuel

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prices forcing many carriers to shut shop or consolidate." In fact, the adverse impact of rising fuel price on airlines profitability and service demand is widespread and such views are supported by the International Air Transport Association (IATA) sources. In the words of Giovanni Bisignani, IATA's Director General and CEO: 'The situation remains bleak. The toxic combination of high oil prices and falling demand continues to poison the industry's profitability' (see IATA press release No. 41, 2008).

Oil price fluctuations over recent years have attracted the attention of many scholars and a number of studies have explored the linkage between oil prices and equity returns. Collectively, these studies have covered almost every major market around the world and a representative sample, particularly of more recent times, include: Hammoudeh & Aleisa, 2004; Basher & Sadorsky, 2006; Park & Ratti, 2008; Miller & Ratti, 2009; Masih *et al*., 2013; Wang *et al*., 2013; Tsai, 2013; and Kumar & Maheswaran, 2013.[6]

Hammoudeh and Aleisa (2004) discuss dynamic links among five (of six) oil rich GCC (Gulf Cooperation Council) markets and the NYMEX oil futures. Their findings suggest that the Saudi market has the most causal linkages with other GCC markets except Oman. Basher and Sadorsky (2006) examine stock returns in 21 emerging stock markets and their evidence indicates that oil price has an impact on stock price returns in emerging markets. Park and Ratti (2008) estimate the effects of oil price shocks and oil price volatility on the real stock returns of the US and 13 European countries and report that oil price shocks have a statistically significant impact on real stock returns. Findings of Miller and Ratti (2009) are supportive of a long-run relationship between the crude oil price and six OECD stock markets. Masih *et al*. (2013) explore the linkage between oil price volatility and stock returns in South Korea. Using a structural VAR analysis, Wang *et al*. (2013) examine the impact of oil price shocks on stock market returns, differentiating oil-importing vs. oil-exporting countries. Tsai (2013) investigates the asymmetric impact of monetary shocks on stock returns conditioned on high vs. non-high oil price events. In a framework combining GARCH and VAR, Kumar and Maheswaran (2013) examine return, volatility, upside/downside risk spillovers from crude oil prices to the major Indian industrial sectors.

There appears to be a limited amount of literature specifically relating to the effects of oil prices on transportation shares, let alone airline shares. Some examples of studies which have at least a partial focus on transportation are: Faff & Brailsford, 1999; Hammoudeh & Li, 2005; and Nandha & Faff, 2008. Faff and Brailsford (1999) look at an Australian setting, identifying the impact of oil prices on various industry sectors including transport; Hammoudeh and Li (2005) consider the US transportation industry and Nandha and Faff (2008) visit the global scene as represented by the global transportation industry index. All these studies report a

negative linkage between the oil price and transport sector stock returns. More recently, Nandha and Brooks (2009) show that oil prices play some role in determining the transport sector returns for the countries falling within the 'Developed', 'Europe' and 'G7' groupings.

Surprisingly, studies covering airlines stocks appear to be non-existent. Perhaps this situation may be partly explained by the difficulty in isolating the oil price factor when there are a variety of factors affecting airline share prices. For instance, other factors might include: the effect of unforeseen events, such as the 9/11 attacks (Kim & Gu, 2004; and Drakos, 2004); changes in government regulations, such as deregulation (Hanna *et al.,* 2005); increased use of jet fuel hedging to increase firm value (Carter *et al.*, 2006); consumer experiences, both positive and negative (Luo, 2007); changed operational arrangements, such as code-sharing (Song *et al.*, 2007); use of different business models (Flouris & Walker, 2007); and the amount of performance information available in inter-firm rivalry (Gong *et al.,* 2008). According to Edelstein and Kilian (2007: 32): "It is widely believed that higher energy prices are associated with reduced consumer demand for airline travel between cities. Private (as opposed to business) airline travel often is a luxury which consumers are likely to forego when their purchasing power falls." Further, Drakos (2004) suggests that the systematic risk of airline stocks has significantly increased since the terrorist incident of 9/11, and their evidence has wide implications for portfolio diversification.

Our study contributes to the literature in the following ways. First, it aims to examine the linkages between the oil price and the airlines stocks which have been rarely covered in any previous study. Second, the impact of oil regimes described by the first Gulf War and 9/11 terror attacks is tested. Third, the selected dataset is of global nature including all the airlines for which data are available in the market. Fourth, this study is the first one which applies the GARCH-M approach to explore the linkage between oil price and stock markets.

The remainder of this study is organized as follows: Section 1 provides a brief overview of the airline industry. The research method and hypotheses are outlined in Section 2. Empirical results are discussed in Section 3 and the last section provides some concluding comments.

1. OIL PRICE AND THE AIRLINE INDUSTRY

In its International Energy Outlook report for the year 2008, the Energy Information Administration (EIA, 2008) identifies the transportation sector as being the major user of liquid energy (mainly oil and petroleum) between 2005 and 2030. The two primary contributing factors to this growth will be the continued demand for personal travel and the increase in freight transport, especially in the

non-OECD countries. While it is acknowledged that improvements in fuel efficiency will occur, it is still estimated that fuel use in this sector will grow by an overall average of 1.85 percent per year (EIA, 2008). The Report notes that air transport forms a significant part of this growth.

The International Air Transport Association's 2008 Annual Report (IATA, 2008) depicts a gloomy outlook for airlines and has predicted a significant decline in profitability and in many cases losses by the end of the year. This prediction was supported during the year in the US when at least three airlines, namely Skybus, Aloha and ATA, filed for bankruptcy. While each of these airlines had a different combination of factors leading to a bankruptcy situation, the fuel price was a common factor (Compart, 2008). No doubt, fuel cost is not the only factor impacting the airlines industry, it appears to be the foremost driver underlying the demise of various airlines. In 2000, the fuel bill constituted only 14.47% of total operating costs when the oil price was $30.33 (average for 2000) but this proportion jumped to more than double (31.70%) as the oil price crossed the $90 barrier in 2008.[7]

It is worth mentioning that there are various types of jet fuel (airline fuel) and crude oil prices. These prices are closely linked and highly correlated. In a way they are inseparable and, thus, crude oil price is a true proxy for the airlines fuel cost. This study is based on West Texas Intermediate (WTI, also known as Texas Light Sweet) spot price as this is a type of oil used as a benchmark in oil pricing and most commonly mentioned in the media. Furthermore, WTI is also an underlying commodity for the New York Mercantile Exchange oil futures contracts. Historically, WTI oil price has nearly perfect correlation with other types of oil and jet fuel prices.

2. RESEARCH METHOD AND HYPOTHESIS DEVELOPMENT

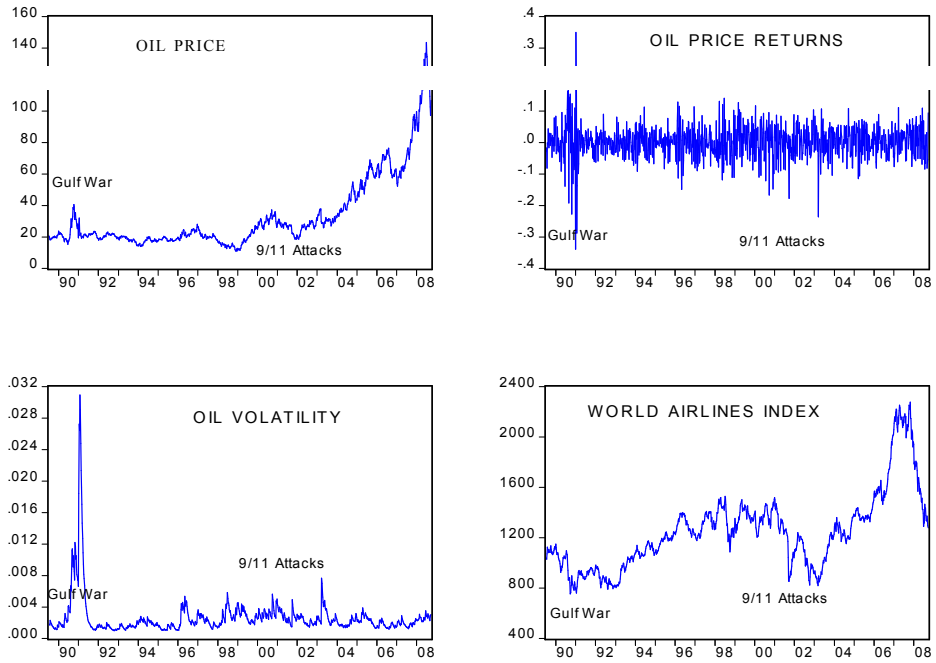
2.1. Data

Seeking to present global evidence of the oil price impact on airline stocks, we select all the major airlines from across the world. On the one hand, we wish to include as many airlines as possible, while on the other hand we wish to cover as lengthy a period as possible. To achieve both of these conflicting objectives, this study is based on two alternative samples of weekly data. Sample 1 covers a longer period (July 1989 to September 2008) but fails to include some important airline countries (e.g. Australia, China, Russia) as they are have a relatively short market history. Sample 2 covers a shorter period (October 1997 to September 2008).

Airline stock returns are based on the total (i.e. inclusive of dividends) return country and regional airline indices sourced from the Datastream and expressed in US dollar terms. The market is represented by the world market index and oil price

by the West Texas Intermediate spot in US dollar terms. Oil price returns and other return series are generated by taking log differences of consecutive index/price values. Oil volatility (OILVOL) is defined as conditional variance of oil price returns generated by a GARCH (1,1) process. Figure 1 presents a visual view of the oil price, oil volatility, oil price returns and the world airlines industry index.

Figure 1. **Oil price, oil volatility, oil price returns and the airlines industry index**



Notes:

a. Gulf war indicates first Gulf war which started on January 17, 1991.
b. 9/11 attacks indicate September 11, 2001 terror attacks in the US.
c. Oil volatility is defined as conditional variance of oil price returns (log differences of oil prices) and generated by a GARCH (1,1) process.
d. World airlines index represents Datastream World Airlines Industry index.

2.2. Model selection

The financial literature is abundant with applications of conditional variance models which include the autoregressive conditional heteroskedastic (ARCH) model introduced by Engle (1982) and the generalised ARCH (GARCH) model developed by Bollerslev (1986). These models have been further extended and extensions like the ARCH and GARCH-in-mean (ARCH-M, GARCH-M) have been applied for studying stock markets. Relative strengths and superiority of these

models over basic ARCH/GARCH models are fully discussed in Engle *et al*. (1987). On the other hand, there are popular asset pricing theories such as the capital asset pricing model (CAPM) and arbitrage pricing theory (APT) which establishes a theoretical relationship between risk and excess return. Application of the ARCH-M/ GARCH-M methodology to the capital asset pricing framework is viewed as an improvement, particularly when the variance of asset returns is time-varying. For example, Elyasiani & Mansur (1998) and Faff *et al*. (2005) apply the GARCH-M method to investigate the impact of interest rate and its volatility on the banking and financial sector returns. Using a modified version of this model, the current study examines the impact of oil price and oil price volatility on airline stocks.

Another important aspect is to account for oil price movements during events such as the first Gulf War and the 9/11 terrorist attacks in the US. When investigating five major oil shocks between 1973 and 2004, De Gregorio *et al*. (2007) find the 1991 shock (first Gulf War) to be the most transitory of them all. Events such as the 9/11 attacks also highlight the effect that an unforeseen event can have on airline stocks. Kim and Gu (2004) study the effect of these attacks on the return and risk profile of airline stocks. They find that the mean weekly return of airline stocks dropped but not to any level of statistical significance. However, the risk profiles increased thus putting pressure on airlines stocks. Airlines which managed to survive this period tended to have lower operating costs and a fuel hedging system in place. In addition, a reflection of Gulf war and 9/11 attacks on the oil markets and the airlines industry is also visible from graphs in Figure 1.

The selected model allows for major shifts in oil prices due to events such as the Gulf War (January 17, 1991) and September 11, 2001 (9/11) terror attacks in the US. Formally, the model can be described by equations (1)-(5) as follows (adapted from Elyasiani & Mansur, 1998):

$$EAR_{j,t} = \phi_0 + \phi_1 EMR_t + \theta_1 \Delta oil_{t-1} + \theta_2 \Delta oil_{t-1} \times D_2 + \theta_3 \Delta oil_{t-1} \times D_3 + \\ + \gamma_1 \log(h_{j,t}) + \varepsilon_{j,t} \quad (1)$$

$$h_{j,t} = \alpha_0 + \alpha_1 \varepsilon^2_{j,t-1} + \beta_1 h_{j,t-1} + \delta_1 OILVOL_{t-1} + \delta_2 OILVOL_{t-1} \times D_2 + \\ + \delta_3 OILVOL_{t-1} \times D_3 \quad (2)$$

$$\Delta oil_t = \omega_0 + \omega_1 \Delta oil_{t-1} + \varepsilon_{O,t} \quad (3)$$

$$OILVOL_t = a_0 + a_1 \varepsilon^2_{O,t-1} + b_1 OILVOL_{t-1} \ , \quad (4)$$

$$\varepsilon_{O,t} | \Omega_{t-1} \sim N(0, h_t) \ \text{ and } \ \varepsilon_{j,t} | \Omega_{t-1} \sim N(0, h_{j,t}) \ , \ j = 1,2, \ldots\ldots n. \quad (5)$$

where, EARj is the excess return for airline j defined as log(Pt/ Pt-1) – WRf,t, Pt indicates price for the corresponding airline index at time t.

WRf,t is the weekly risk free rate at time t calculated as: annualized US 3M treasury bill rate at time t x 7 / 36500;

EMRt (excess market return at time t) is defined as: log(Mt / Mt-1) – WRf,t, Mt indicates market price represented by world market index; ΔOIL_t = change in oil price during time t = log(Oilt) – log(Oilt-1), Oilt indicates oil price at time t.

D2 and D3 are oil price dummies aimed at capturing the Gulf War and September 11, 2001 (9/11) terror attacks in the US. To avoid the 'dummy variable trap', the pre-Gulf War period is captured as the base case rather than by another dummy D1, and the dummies D2 and D3 are defined as:
D2 = 1 if January 17, 1991 <= TIME <= September 11, 2001; and = 0 otherwise.
D3 = 1 if TIME >= September 12, 2001; and = 0 otherwise.

OILVOLt (Oil volatility at time t) is defined as conditional variance of oil price change (log differences of oil prices) and generated by a GARCH (1,1) process.

Following the practice in literature, the variance term is included in logarithmic form. However, unlike Elyasiani & Mansur (1998) and Faff *et al*. (2005), our model excludes lagged excess (airline) return and replaces it with EMR (excess market return) as an independent factor. The reasons for this modification are: first, the financial literature argues that stock market returns are independent and generated by a random process. Second, our empirical estimates[8] do not support an autoregressive component in the model.

As indicated in the data section, this study examines two samples. Sample 1 covers a longer period (July 1989 to September 2008) but a smaller number of airlines. Sample 2 covers October 1997 to September 2008 but enables us to include airlines with a short market history. Considering that sample 2 does not have enough data for post Gulf War and pre September 11, 2001, the dummy D2 becomes irrelevant. Accordingly, the above mentioned model needs modification with equations (1) and (2) changed as follows:

$$EAR_{j,t} = \phi_0 + \phi_1 EMR_t + \theta_1 \Delta oil_{t-1} + \theta_3 \Delta oil_{t-1} \times D_3 + \gamma_1 \log(h_{j,t}) + \varepsilon_{j,t} \qquad (1^*)$$

$$h_{j,t} = \alpha_0 + \alpha_1 \varepsilon^2_{j,t-1} + \beta_1 h_{j,t-1} + \delta_1 OILVOL_{t-1} + \delta_3 OILVOL_{t-1} \times D_3 \qquad (2^*)$$

2.3. Key research questions and hypothesis

The key research questions in this study are aimed at examining the oil price and oil price volatility effects on airline stocks. These research questions and corresponding hypotheses are detailed in Table 1.

Table 1. **Key research questions and hypothesis for samples 1 and 2**

Research Question	Null Hypothesis (Sample 1)	Null Hypothesis (Sample 2)
Q1: Are airline returns sensitive to oil price changes?	$H_{1a}: \theta_1 = 0$ $H_{1b}: \theta_1 + \theta_2 = 0$ $H_{1c}: \theta_1 + \theta_3 = 0$	$H^*_{1a}: \theta_1 = 0$ $H^*_{1b}: \theta_1 + \theta_3 = 0$
Q2: Is the oil price sensitivity of airline stock returns affected by oil regimes described by globally significant events such as the gulf war and 9/11 terrorist attacks?	$H_{2a}: \theta_2 = 0$ $H_{2b}: \theta_3 = 0$ $H_{2c}: \theta_2 = \theta_3 = 0$	$H^*_2: \theta_3 = 0$
Q3: Does oil price volatility have any effect on airline stock risk?	$H_{3a}: \delta_1 = 0$ $H_{3b}: \delta_1 + \delta_2 = 0$ $H_{3c}: \delta_1 + \delta_3 = 0$	$H^*_{3a}: \delta_1 = 0$ $H^*_{3b}: \delta_1 + \delta_3 = 0$
Q4: Is the effect of oil price volatility on airline stock risk affected by oil regimes described by globally significant events such as the gulf war and 9/11 terrorist attacks?	$H_{4a}: \delta_2 = 0$ $H_{4b}: \delta_3 = 0$ $H_{4c}: \delta_2 = \delta_3 = 0$	$H^*_4: \delta_3 = 0$
Q5: Can we dismiss the total effect of oil price on airline stock risk and return – either through oil price sensitivity or through oil price volatility?	$H_{5a}: \theta_1 = \delta_1 = 0$ $H_{5b}: \theta_1 + \theta_2 = \delta_1 + \delta$ $H_{5c}: \theta_1 + \theta_3 = \delta_1 + \delta$	$H^*_{5a}: \theta_1 = \delta_1 = 0$ $H^*_{5b}: \theta_1 + \theta_3 = \delta_1 + \delta$

Notes:

a. Sample 1 covers July 1989 to September 2008 period and the corresponding parameter are described in equations 1 and 2:

$$EAR_{j,t} = \phi_0 + \phi_1 EMR_t + \theta_1 \Delta oil_{t-1} + \theta_2 \Delta oil_{t-1} \times D_2 + \theta_3 \Delta oil_{t-1} \times D_3 + \\ + \gamma_1 \log(h_{j,t}) + \varepsilon_{j,t}$$

$$h_{j,t} = \alpha_0 + \alpha_1 \varepsilon^2_{j,t-1} + \beta_1 h_{j,t-1} + \delta_1 OILVOL_{t-1} + \delta_2 OILVOL_{t-1} \times D_2 + \\ + \delta_3 OILVOL_{t-1} \times D_3$$

b. Sample 2 covers October 1997 to September 2008 period and the corresponding parameter are described in equations 1* and 2*:

$$EAR_{j,t} = \phi_0 + \phi_1 EMR_t + \theta_1 \Delta oil_{t-1} + \theta_3 \Delta oil_{t-1} \times D_3 + \gamma_1 \log(h_{j,t}) + \varepsilon_{j,t}$$

$$h_{j,t} = \alpha_0 + \alpha_1 \varepsilon^2_{j,t-1} + \beta_1 h_{j,t-1} + \delta_1 OILVOL_{t-1} + \delta_3 OILVOL_{t-1} \times D_3$$

3. DISCUSSION OF RESULTS

3.1. Oil price and airlines stock returns

Hypothesis tests for sample 1 are reported in Table 2. In general, results (H1a, H1b and H1c) appear to indicate that oil price changes do not have any significant impact on airlines stocks. Furthermore, results (H2a, H2b and H2c) suggest that oil regimes described by the Gulf War and 9/11 terrorist attacks do not have any pricing implications for airline stocks. However, France and Malaysian airlines stocks appear to be exceptions where airline stocks show some sensitivity to oil price changes combined with the oil regimes determined by the first Gulf War and/or 9/11 US attacks.

3.2. Oil price volatility and airlines stock risk

Oil price volatility alone (H3a) does not show any significant impact on airlines stock risk, but oil volatility combined with oil regimes (H3b and H3c) appear to have a significant impact on airlines stock risk of many countries. For example, airline stock risk for France, Japan and the regions described as Asia, Developed Markets, Pacific Basin and World show significant sensitivity to the combined effects of oil volatility and oil price regimes. Further, Korea and North America show significant sensitivity to the combined effects of oil volatility and the oil price regime determined by the first Gulf War whereas Canada, Germany, Hong Kong, Malaysia and the US airlines stock risk appears to be influenced by the combined effects of oil volatility and oil price regime described by the 9/11 airline attacks. The influence of oil regimes on the effect of oil price volatility on airline stock risk is also supported by the oil regime specific results (H4a, H4b and H4c).

3.3. Oil price, oil price volatility and the airlines stocks

Overall, results (H5a) suggest that we can dismiss the effect of oil price and oil price volatility on airlines stock returns and risk. However, there is significant evidence (H5b and H5c) that the oil price and oil price volatility combined with oil regimes (as described previously) have some implications for airlines stock risk and returns. Moreover, the combined impact of oil volatility and oil price regimes on airline returns is found relatively more pronounced in the case of 9/11 terrorist attacks than the first Gulf War.

Table 2. **Hypothesis tests for airlines included in sample 1 (July 1989 to September 2008)**

Country/ region	H1a	H1b	H1c	H2a	H2b	H2c	H3a	H3b	H3c	H4a	H4b	H4c	H5a	H5b	H5c
AUSTRIA	0.3944	2.8803*	0.7613	1.5270	0.9631	1.5270	0.2758	1.7235	1.8155	0.0038	0.0030	0.3832	1.0042	5.6560*	2.7585
	(0.5300)	(0.0897)	(0.3829)	(0.2166)	(0.3264)	(0.4660)	(0.5995)	(0.1892)	(0.1779)	(0.9506)	(0.9561)	(0.8256)	(0.6053)	(0.0591)	(0.2518)
CANADA	0.9365	0.0793	0.4574	0.8371	1.3650	1.5040	1.5824	0.6751	10.409***	0.6855	3.5042*	10.665***	2.4175	0.8735	10.522***
	(0.3332)	(0.7782)	(0.4988)	(0.3602)	(0.2427)	(0.4714)	(0.2084)	(0.4113)	(0.0013)	(0.4077)	(0.0612)	(0.0048)	(0.2986)	(0.6461)	(0.0052)
FRANCE	0.1757	5.0426**	6.0331**	3.2344*	1.8957	3.2906	1.7447	26.990***	36.743***	8.8919***	23.095***	79.164***	1.7516	27.330***	36.938***
	(0.6751)	(0.0247)	(0.0140)	(0.0721)	(0.1686)	(0.1930)	(0.1865)	(0.0000)	(0.0000)	(0.0029)	(0.0000)	(0.0000)	(0.4165)	(0.0000)	(0.0000)
GERMANY	0.0331	0.2782	0.2902	0.0069	0.1434	0.5971	0.2685	0.2548	4.2493**	0.7264	3.7172*	6.1578**	0.3161	0.5315	4.3790
	(0.8557)	(0.5979)	(0.5901)	(0.9338)	(0.7049)	(0.7419)	(0.6043)	(0.6137)	(0.0393)	(0.3940)	(0.0539)	(0.0460)	(0.8538)	(0.7666)	(0.1120)
HONG KONG	0.0311	0.9411	0.1610	0.5882	0.1650	0.5882	3.2742*	0.3618	13.298***	0.7364	1.2616	13.307***	3.2782	1.3538	13.322***
	(0.8601)	(0.3320)	(0.6882)	(0.4431)	(0.6846)	(0.7452)	(0.0704)	(0.5475)	(0.0003)	(0.3908)	(0.2614)	(0.0013)	(0.1942)	(0.5082)	(0.0013)
JAPAN	1.2715	1.1554	1.0359	0.3535	0.3378	0.3789	0.2044	7.0321***	10.932***	2.5611	6.0707**	6.9358**	1.3221	7.6979**	13.239***
	(0.2595)	(0.2824)	(0.3088)	(0.5522)	(0.5611)	(0.8274)	(0.6512)	(0.0080)	(0.0009)	(0.1095)	(0.0137)	(0.0312)	(0.5163)	(0.0213)	(0.0013)

Country/ region	H1a	H1b	H1c	H2a	H2b	H2c	H3a	H3b	H3c	H4a	H4b	H4c	H5a	H5b	H5c
KOREA	0.3240	0.0176	0.1106	0.0741	0.3434	0.3484	0.0023	6.1500**	0.0060	1.3255	0.0019	2.1781	0.3255	6.1697**	0.1148
	(0.5692)	(0.8944)	(0.7394)	(0.7854)	(0.5579)	(0.8401)	(0.9619)	(0.0131)	(0.9385)	(0.2496)	(0.9648)	(0.3365)	(0.8498)	(0.0457)	(0.9442)
MALAYSIA	0.0687	0.8219	9.5452***	0.4251	1.9385	2.7322	2.4009	0.2071	8.7927***	1.4757	5.8840**	18.512***	2.5748	0.9853	18.045***
	(0.7932)	(0.3646)	(0.0020)	(0.5144)	(0.1638)	(0.2551)	(0.1213)	(0.6490)	(0.0030)	(0.2245)	(0.0153)	(0.0001)	(0.2760)	(0.6110)	(0.0001)
SINGAPORE	1.2823	3.6783*	3.0605*	0.0032	0.0026	0.0034	0.6715	1.7258	0.7432	1.3137	1.1090	1.3137	2.3606	4.9129*	3.6958
	(0.2575)	(0.0551)	(0.0802)	(0.9548)	(0.9597)	(0.9983)	(0.4125)	(0.1890)	(0.3886)	(0.2517)	(0.2923)	(0.5185)	(0.3072)	(0.0857)	(0.1576)
UK	1.7988	0.7218	0.2420	0.5733	0.5646	0.6856	1.0808	1.9070	3.1079*	2.4881	3.8558**	4.0421	4.1195	3.2277	3.3794
	(0.1799)	(0.3955)	(0.6228)	(0.4490)	(0.4524)	(0.7098)	(0.2985)	(0.1673)	(0.0779)	(0.1147)	(0.0496)	(0.1325)	(0.1275)	(0.1991)	(0.1846)

3.4. More recent evidence on oil price, oil price volatility and the airline stocks

Sample 2 provides a narrower timeframe than covered in sample 1. Consequently, we are left with only one oil regime determined by the 9/11 terror attacks. Hypothesis tests for sample 2 are reported in Table 3. These results appear to tell the same story that the oil price or oil price regime 'alone' do not have any noticeable implication for airline stocks. However, there is some evidence of oil volatility having implications for airline stocks, but the combined effects of oil volatility and the oil regime determined by the 9/11 attacks appears to be much more pronounced.

Table 3. **Hypothesis tests for airlines included in sample 2 (October 1997 to September 2008)**

Country/region	H1a	H1b	H2	H3a	H3b	H4	H5a	H5b
AUSTRIA	2.8628*	0.4323	0.5688	4.6118**	7.2246***	4.5605**	6.9577**	8.6915**
	(0.0907)	(0.5109)	(0.4507)	(0.0318)	(0.0072)	(0.0327)	(0.0308)	(0.0130)
CANADA	0.0380	0.6990	0.1398	4.8306**	0.6082	6.1829**	4.8457*	1.2935**
	(0.8455)	(0.4031)	(0.7085)	(0.0280)	(0.4355)	(0.0129)	(0.0887)	(0.5238)
FRANCE	2.2540	4.7943**	0.1051	0.0140	4.0540**	8.4974***	2.2666	7.7018**
	(0.1333)	(0.0286)	(0.7458)	(0.9059)	(0.0441)	(0.0036)	(0.3220)	(0.0213)
GERMANY	0.0039	0.2244	0.0660	0.0801	2.4994	5.8367**	0.0862	2.6599
	(0.9503)	(0.6357)	(0.7972)	(0.7772)	(0.1139)	(0.0157)	(0.9578)	(0.2645)
HONG KONG	3.3200*	0.1875	3.3813*	40.326***	252.18***	0.0228	51.480***	254.68***
	(0.0684)	(0.6650)	(0.0659)	(0.0000)	(0.0000)	(0.8799)	(0.0000)	(0.0000)
JAPAN	0.6265	0.7749	0.0525	0.6541	2.4222	4.6650**	1.3071	3.8936
	(0.4287)	(0.3787)	(0.8188)	(0.4187)	(0.1196)	(0.0308)	(0.5202)	(0.1427)
KOREA	0.8232	0.4009	1.2103	2.3436	1.9889	0.0015	3.1747	2.1321
	(0.3642)	(0.5266)	(0.2713)	(0.1258)	(0.1585)	(0.9695)	(0.2045)	(0.3444)
MALAYSIA	3.0194*	6.5851**	0.7254	1201266***	121.18***	0.9379	1201806***	136.19***
	(0.0823)	(0.0103)	(0.3944)	(0.0000)	(0.0000)	(0.3328)	(0.0000)	(0.0000)
SINGAPORE	0.7703	3.3030*	0.0090	2.7800*	1.3940	5.1811**	3.9237	4.1499
	(0.3801)	(0.0692)	(0.9244)	(0.0943)	(0.2377)	(0.0228)	(0.1406)	(0.1256)
UK	0.1283	0.0562	0.1849	4.9514**	12.902***	8.6456***	4.9733*	13.246***
	(0.7202)	(0.8126)	(0.6672)	(0.0261)	(0.0003)	(0.0033)	(0.0832)	(0.0013)
US	0.4017	0.6866	0.0275	1.2156**	12.188***	9.9221***	1.7166	13.045***
	(0.5262)	(0.4073)	(0.8684)	(0.2702)	(0.0005)	(0.0016)	(0.4239)	(0.0015)

Country/region	H1a	H1b	H2	H3a	H3b	H4	H5a	H5b
ASIA	1.1742	3.3794*	0.0153	3.1268*	9.3406***	8.5826***	4.0978	11.780***
	(0.2785)	(0.0660)	(0.9016)	(0.0770)	(0.0022)	(0.0034)	(0.1289)	(0.0028)
DEVELOPED MKTS.	1.9021	0.4377	0.8606	0.0019	4.3211**	8.4620***	1.9069	7.0370**
	(0.1678)	(0.5083)	(0.3536)	(0.9648)	(0.0376)	(0.0036)	(0.3854)	(0.0296)
EUROPE	0.0656	0.4345	0.0020	21.283***	57.405***	19.007***	21.304***	61.494***
	(0.7978)	(0.5098)	(0.9645)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
N.AMERICA	1.7820	0.3741	0.2936	17.919***	27.520***	0.1205	19.401***	27.819***
	(0.1819)	(0.5408)	(0.5879)	(0.0000)	(0.0000)	(0.7285)	(0.0001)	(0.0000)
PACIFIC BASIN	0.9682	2.7203*	0.0077	0.7235	4.0043**	5.9445**	1.6393	6.4674**
	(0.3251)	(0.0991)	(0.9301)	(0.3950)	(0.0454)	(0.0148)	(0.4406)	(0.0394)
WORLD	1.0224	2.8951*	0.0017	1.3137	10.475***	18.182***	2.4096	14.246***
	(0.3120)	(0.0888)	(0.9667)	(0.2517)	(0.0012)	(0.0000)	(0.2998)	(0.0008)
AUSTRALIA	0.0001	1.7674	0.3725	0.0570	8.1643***	9.1400***	0.0576	10.244***
	(0.9910)	(0.1837)	(0.5417)	(0.8112)	(0.0043)	(0.0025)	(0.9716)	(0.0060)
CHILE	0.0085	0.9034	0.1915	2.6364	0.3495	2.3391	2.8276	1.2919
	(0.9267)	(0.3419)	(0.6617)	(0.1044)	(0.5544)	(0.1262)	(0.2432)	(0.5242)
CHINA	0.7772	1.3790	0.1124	3.5288*	6.4269**	0.4527	4.0961	7.5222**
	(0.3780)	(0.2403)	(0.7374)	(0.0603)	(0.0112)	(0.5010)	(0.1290)	(0.0233)
FINLAND	0.0430	0.0557	0.0942	4.3042**	6.4212**	5.5092**	4.4978	6.5832**
	(0.8358)	(0.8134)	(0.7590)	(0.0380)	(0.0113)	(0.0189)	(0.1055)	(0.0372)
IRELAND	0.5688	0.5633	1.1445	0.0846	0.1276	1.0414	0.6793	0.6830
	(0.4507)	(0.4529)	(0.2847)	(0.7712)	(0.7209)	(0.3075)	(0.7120)	(0.7107)
NEW ZEALAND	0.4040	0.0032	0.2110	0.5239	0.0108	1.4109	0.8909	0.0140
	(0.5250)	(0.9550)	(0.6460)	(0.4692)	(0.9172)	(0.2349)	(0.6405)	(0.9930)
PHILIPPINES	1.8999	1.5390	3.3263*	5.5142**	54.347***	31.256***	5.7711*	57.370***
	(0.1681)	(0.2148)	(0.0682)	(0.0189)	(0.0000)	(0.0000)	(0.0558)	(0.0000)
RUSSIA	0.0547	0.0007	0.0238	1.2787	17.984***	6.9895***	1.2831	17.986***
	(0.8151)	(0.9786)	(0.8773)	(0.2581)	(0.0000)	(0.0082)	(0.5265)	(0.0001)
TAIWAN	0.0089	0.1047	0.0251	2.4677	2.3822	0.3188	2.5022	2.3880
	(0.9249)	(0.7463)	(0.8741)	(0.1162)	(0.1227)	(0.5723)	(0.2862)	(0.3030)
THAILAND	0.0808	4.9319**	0.5940	3.5098*	1.4105	2.5520	3.5227	7.4291**
	(0.7763)	(0.0264)	(0.4409)	(0.0610)	(0.2350)	(0.1102)	(0.1718)	(0.0244)

Country/region	H1a	H1b	H2	H3a	H3b	H4	H5a	H5b
TURKEY	0.0010	1.2602	0.4398	3.1970*	29.121***	153.45***	3.2010	30.325***
	(0.9752)	(0.2616)	(0.5072)	(0.0738)	(0.0000)	(0.0000)	(0.2018)	(0.0000)
EMERGING MARKETS	0.0796	4.5896**	1.7574	0.0087	1.3514	3.0837*	0.0872	5.5222*
	(0.7778)	(0.0322)	(0.1849)	(0.9258)	(0.2450)	(0.0791)	(0.9573)	(0.0632)
LATIN AMERICA	0.1499	0.1643	0.2753	5.7661**	0.3052	6.09030**	5.7666*	0.4577
	(0.6986)	(0.6852)	(0.5998)	(0.0163)	(0.5806)	(0.0136)	(0.0560)	(0.7955)

Notes:
a. Values in the table are Wald test 'Chi-square' test stat with corresponding p-values in parentheses.
b. ***,**,* indicate statistical significance at 1%, 5% and 10% levels, respectively.

CONCLUSION

This study tests a widely held belief that higher oil prices have adverse impact on the airlines stocks. By selecting a globally representative dataset, we have demonstrated that oil price or oil price regimes (determined by globally significant events such as the Gulf War and 9/11 attacks) 'alone' do not have any significant implications for airline stock pricing. However, oil price volatility combined with oil regimes appears to have implications for airline stocks in some countries. Overall, the findings of this study appear to contrast with the market/media perception that higher oil prices or oil volatility are bad news for the airlines industry. A possible explanation for this contradictory empirical evidence may be that the airlines are in a better position to estimate their oil price risk and take hedging positions as appropriate. However, airline stocks appear to be significantly prone to the combined effects of oil volatility and events such as the Gulf War and the 9/11 terrorist attacks.

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[6] In addition, there are various other studies focused on the linkage between the oil price and stock markets. For example, Hamilton (1983); Chen *et al*. (1986); Gisser & Goodwin (1986); Al-Mudhaf and Goodwin (1993); Huang *et al*. (1996); Jones & Kaul (1996); Sadorsky (1999); Papapetrou (2001); El-Sharif *et al*. (2005); Huang *et al*. (2005); Nandha and Faff (2005); Boyer and Filion (2007); Hammoudeh and Choi (2007); Driesprong *et al*. (2008); and Hamilton (2009). These studies cover stock markets from all over the world and offer variety in their datasets, research methods and conclusions.

[7] Source: icao / iata. As reported in the financial forecast (March, 2009) briefing note on the IATA website (accessed on May 29, 2009): www.iata.org/economics

[8] Initially, results were estimated by including lagged EAR for all airlines, but none was found significant and all adjR^2 values were negative or close to zero. Accordingly, we dropped lagged EAR and replaced it by EMR (excess market return). All EMR coefficients were found to be significant at 1% level and values of adjR^2 are relatively much higher.