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Unlocking the Final Code to Managing Financial Risk in the Airline Industry

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UNLOCKING THE FINAL CODE TO MANAGING FINANCIAL RISK IN THE PASSENGER AIR TRAVEL INDUSTRY

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ABSTRACT

This paper reports our findings on the effectiveness of revenue hedging[1] using the newly proposed price indices by Skytra. In the example analyzed we find that when hedged, if United Airlines' transatlantic ticket price yields fell as much as 98%, its revenues would have only fallen 8%.

Firstly, we explore revenue hedging and the evolution of financial risk management practices for the aviation industry. Until now, the industry has been confined to hedging risks posed by its major cost drivers, including fuel, foreign exchange and interest rates. However, even the most significant driver of these costs (fuel) makes up only 20 to 30% % of the total cost and until now, airlines did not have an ability to hedge the revenue side of their profit and loss account, limiting the impact of their hedging strategies. Skytra, a subsidiary of Airbus, has recently proposed a novel approach to managing the yield risk for airlines, which will complement the cost side hedging. Further, the ability to hedge yield would make the treasury functions of an airline more complete, by allowing it to focus on its two most significant drivers of economic outcome- yield and fuel.

Keywords: Hedging, Skytra Price Indices, Derivatives

1. INTRODUCTION

Risk management is the practice of defining the risk level a firm desires, identifying the risk level the firm currently has, and using derivatives or other means to adjust the actual level of risk to the desired level of risk (Chance and Brooks, 2016). For example, for an airline, its core activity and expertise is in transporting people safely from one destination to the other. However, airlines in transporting people and goods from one place to another, assume a number of risks over which they have little or no control or expertise. These risks such as the cost of fuel, borrowing costs and exchange rate have a significant influence on the profitability of airlines. Although some airlines merely accept all these risks as part of doing business, others choose to actively manage these risks by hedging their fuel price, interest rates and currency.

Whether airlines choose to hedge their costs or not, they have long recognized their uncontrollable risks from rising fuel prices, interest rates or unfavorable currency movements. While the cost side of the aviation business draws most of the attention, it is the inability to exercise significant control over revenues, which makes the aviation business riskier and more volatile than other service centric businesses such as retail and consulting. Effective risk management, therefore, must consider both the revenue and cost of an airline. However, until recently, airlines did not have the tools or the market infrastructure to hedge their revenues. *Skytra*, a subsidiary of Airbus, is developing the infrastructure necessary for an airline to hedge its yield. This introductory paper, which is the first in a series of research papers, examines the history of the airline industry; the tools and mechanisms airlines use to hedge and makes a case for revenue hedging using the infrastructure proposed by *Skytra.*

[1] The Skytra Price Indices can help the airlines only partially hedge their revenues, as they are Price Indices, and therefore, do not give volume protection. However using Price Indices to hedge revenue makes sense, as it's the most variable part used by Airline Revenue Management team to hedge their revenue.

The paper is organized as follows. This introductory section looks at the nature of the airline business it's current and historical state and discusses the major cost drivers in the industry. Section 2, discusses the tools and infrastructure proposed by *Skytra* to enable an airline to hedge its yield. Section 3, illustrates through an example, how airlines can hedge their yields using the *Skytra* Price Indices. Section 4 concludes and discusses future research papers in this series.

1.1 History of the Airline Industry

The airline industry today can trace its origins to the discovery of the jet engine in 1930[3] and the deregulation act of 1978. With the discovery of the jet engine, jet-powered aircraft became the primary mode of long-distance travel in the world and the deregulation act ushered in an era of free market-competition in the airline industry. The growth of the low cost business model pioneered in the U.S by Southwest airlines in the 1970's, and later emulated by Ryan Air and EasyJet in Europe, further intensified competition in the industry. While competition in the airline industry has been in general beneficial to the consumers, by making airline travel more affordable, the increased competition combined with the cyclical nature of the industry has resulted in low profit margins and pushed the industry repeatedly into bankruptcy over the last decades.

1.2 The Economics of the Airline Business

The airline industry has therefore evolved into a risky business over the years due to its cyclical nature, high capital intensity compounded by its high operational (high fixed cost relative to variable cost) and financial leverage (high debt to equity) and regulatory oversight. This has made it difficult for the industry to be consistently profitable. For example, the return on invested capital (ROIC) for the industry as a whole over the last two and half decades has ranged between 0% and 7% (IATA, 2013). Not considering the impact of COVID-19, the current operating margin forecast for the industry is less than 6.0% for 2020 (Pearce, 2019), which is amongst the lowest across major industry sectors. Further, due to its inherent characteristics outlined above, the airline industry is susceptible to large and destabilizing external shocks. Over the last few decades, the industry has been shaken to its core by such disturbances as –the oil crisis of 1970s; 9/11 terrorist attack; global recession in 2008; SARS, Ebola, H1N1 and now COVID-19. In each instance, the industry profitability was impacted in a severely negative fashion. In 2001 and 2008, for example, the industry-wide operating margins had dwindled to -4% and 0% respectively. (Pearce, 2019). Such disruptions only highlight the aviation industry's glaring need to have better control over the risks arising from its uncontrollable costs and yield.

Despite these challenges, air travel remains one of the safest mode of travel. The airline industry also has been remarkably resilient and has adapted to the new challenges posed by increased competition from the low cost carriers by unbundling their product and increasing their ancillary revenues such as baggage fees, charging for onboard food and services, creating new no frills basic economy fare class, and practicing capacity discipline. Airlines, especially in the U.S, have become leaner by consolidating and shedding their pension liabilities as they have remerged from bankruptcy. While airlines, particularly in Europe, have successfully hedged their fuel expenses to control one of their most important costs.

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[3] Sir Frank Whittle invented the turbojet engine and patented it in 1930, while the de Havilland DH 106 Comet was the world's first commercial jet airliner.

However, the fundamental risks facing the airline industry remain. The fiercely competitive nature of the industry has prevented the airlines from passing on their increases in their uncontrollable cost such as fuel to the consumers in terms of increased ticket prices (Carter, et al., 2006). The high operating and financial leverage in the industry has made it vulnerable to business cycles and external shocks and has pushed the industry repeatedly into bankruptcy. IATA currently estimates the global airline industry losses from the current COVID-19 pandemic will be $314 billion and traffic measured in revenue passenger kilometers (RPK) will be down 48% this year (IATA, 2020). If the industry has to remerge from this crisis, it needs to take a hard look at not only controlling its cost but also stabilizing its revenue.

The concept of revenue hedging, though prevalent in other industries (it has been widely used in the farming industry for over a century, where rice, corn or wheat farmers would sell futures contracts to protect themselves from decreases in future prices), it has been rarely practiced in the airline industry. Part of the reasons why revenue hedging has not been popular is that the necessary market infrastructure and price indices did not previously exist. *Skytra,* a subsidiary of Airbus, has created the Price Indices and is establishing the market infrastructure necessary for airlines to hedge yields.

2. SKYTRA PRICE INDICES

As alluded to in the previous section, until recently airlines could not hedge their yield stream because no mechanism existed to "lock in" yields (average fare per passenger per kilometer). The yield indices proposed by *Skytra* present a new and significant tool that will allow the implementation of a comprehensive risk management strategy. *Skytra* Price Indices are constructed and managed to reflect the wholesale price of air travel per km flown by an individual passenger (RRPK) in identified markets both regional & interregional, for economy class travel (*Skytra*, 2020).

Currently *Skytra* publishes 6 Price indices, based on average price of economy class fares (namely Europe, North America, Asia-Pacific, Europe-North America, Asia Pacific-Europe, Asia Pacific-North America, covering 70% of traffic) but will eventually publish 28 indices (7 regional and 21 inter-regional indices). For each market, *Skytra* calculates and publishes a "daily value" and a twenty-eight day rolling average of the daily value. The data, methodology are identical in both cases, and the rolling average will be the average of the 27 previous day plus present day values, and will be published alongside the daily value. According to *Skytra*, pre COVID-19 ticket price volatility ranges from 7% to 22% for the different regional and interregional indices. While all airlines will benefit from hedging their yield, airlines operating in a higher volatility region, are expected to benefit more, from hedging their yield. In addition, *Skytra* is in the process of getting approvals from the UK's Financial Conduct Authority to be a registered Benchmark Administrator for its Price Indices and is also working with financial firms to establish the trading venue infrastructure.

2.1 Parties and Counter-parties

Trading in *Skytra* indices is subject to the same market forces as any other platform and instruments. That is, for the airlines to be able to confidently engage in trading of *Skytra* indices, the market for these indices must be robust, including buyers/sellers or parties and counter–parties.

The most natural sellers of these indices will be airlines, lessors, investors and speculators who will hedge against a fall in the airline yields (RRPK) by selling futures, buying puts, building collars (selling a call option and purchasing a put option) and using swaps. On the other side, Business-to-business (B2B) travel agents or large multinational corporates, Business-to-consumers (B2C) travel agents and airports, hotels, investors and speculators would be natural buyers of the hedging contracts by buying futures, call options and using swaps. By trading in the *Skytra* Price Indices, travel agents can therefore, pass on stability or new forms of optionality to individual travelers or corporates.

2.2 Contract Specifications

The *Skytra* contract would be a standardized contract and would accommodate different exchange types such as central limit order book (CLOB), Request for Quote (RFQ) and process trade. The unit of trade for each contract would be 100,000 RPKs. The contract would trade during normal European trading hours with windows to process trades and use RFQ and would allow for the full range of standard order types and strategy trading functionality. The contracts will be for the next three serial months, quarters up to 2 years out and would be cash settled.

3. HEDGING USING SKYTRA PRICE INDICES

As outlined above, an airline can use the *Skytra* Price Indices to hedge their yield by selling futures, building a collar (selling a call option and buying a put option) or using a swap. This section outlines how an airline, such as United Airlines, can use a collar strategy to hedge its yield.

3.1: Building a collar to hedge yield: An example using United Airlines Transatlantic Yield

A collar is a combination of a put option and a call option. For United Airlines (UAL), planning to hedge its yield, a collar strategy involves buying an out-of-the-money put below the current index value and selling a call. The purchase of a put option provides protection during the life of the option against downward yield movements below the strike price. The premium received from selling the call option helps offset the cost of the put option. By establishing a collar strategy, a minimum and maximum bound is created around a hedger's position until the expiration of the options. One can create a zero cost collar (where call and put premiums are equal) or a premium collar (where call premiums are higher than put premiums). Collars, therefore, are a highly efficient vehicle for getting protection from unfavorable movements in prices and enables the airlines to reduce their yield volatility.

In order to show how UAL can effectively hedge its yield by using the *Skytra* Price indices, this example uses, UAL's Transatlantic (TA) yield and builds a Zero Cost collar strategy. A Zero Cost collar strategy involves writing a call and buying a put, where the call premium equals the put premium based on a pre-selected yield UAL would like to protect.

UAL's 2019 TA revenues were USD$7.387x$10^9$. *Skytra's* TA RRPK index for the same period stood at 0.087. Thus, UAL's (RRPK) can be obtained by dividing its TA revenues by the *Skytra* Price Index value[4]. Doing so, results in \$8.491x10^{10} revenue passenger kilometers. Each of *Skytra's* option contracts represents 1.0x10^5 kilometers; thus hedging the entire TA yield stream would require 849,080 option contracts.

The Black-Scholes-Merton (BSM) model (1973) is used to compute the call and put prices using the following inputs: a risk free rate of 0.12% (the 3-month Treasury as of April 28, 2020), time to expiration of three months (for simplicity's sake – we assume the first contracts will have shorter

[4] To simplify the analysis we assume that United Airlines average ticket prices are equal to the Skytra Price Index but different airlines could have average ticket prices, which are cheaper or more expensive than the Skytra Price Index.

maturities) and a *Skytra* TA volatility of 11% (calculated using *Skytra* Price Index data). The index is currently calculated to be at 0.1307. It is then assumed, that UAL sells a call with a strike price of 0.1427 (an arbitrary number), above the current index value, and purchases a put at a strike price of 0.1200, which is below the current index price. Based on these inputs, the BSM model yields a call contract price of $18. Applying this price to the 849,080 contracts, UAL could conceivably collect $14,978,430 selling these calls. Using the above inputs, but with a strike price of 0.1200 for purchasing the put, the put premium is also obtained as $18/contract and the cost of purchasing the put be $14,978,435, the same as the call premium collected, making this a Zero Cost collar. Figure 1 below shows a graphical depiction of the collar.

If the index settles above 0.1427, the counterparty, which purchased the call option, would exercise the call option and UAL would make a loss on the contract. On the contrary, if the index falls below 0.1200, UAL will exercise its put option to protect its yield. The collar strategy therefore provides a range of the index with the upper bound at the call strike price and lower floor at the put strike price.

The numerical example in Table 1, below shows how a collar strategy can protect UAL's yield under different scenarios, based on an assumed call strike price of 0.1407 and a put strike price of 0.1200.

Scenario 1: Index value is 0.0025[5]

In this scenario, since the index value is below $0.1200, UAL will exercise its put option. Further, since the index is below 0.1407, the call would not be exercised. The payoff from the hedge contract can be computed as follows:

*((0.12 – 0.0025) * 849080*100,000)/ 10^6 = $9,977m.*

If UAL were unhedged, its total revenue would be

*(0.0025 * 84,908,045,977)/10^6 = $212 m.*

However if UAL were hedged, adding the collar payoff, the total revenue for UAL would be

Collar Payoff ($9,977m) + Unhedged Revenue ($212m) = $10,189m.

Scenario 2: Index Value is 0.1030.

In this scenario, since the index value is once again below 0.1200, UAL will exercise its put option. Further, since the index is below 0.1407, the call would not be exercised. The payoff from the hedge contract can be computed as follows:

*((0.12 – 0.1030) * 849080*100,000)/ 10^6 = $1443m.*

If UAL were unhedged, its total revenue would be

*(0.0025 * 84,908,045,977)/10^6 = $8746m*

However if UAL were hedged, adding the collar payoff, the total revenue for UAL would be

Collar Payoff ($1443m) + Unhedged Revenue ($8746m) = $10,189m.

Scenario 3: Index Value is 0.1307

[5] The Skytra Price Index value chosen is an arbitrary value to show how a dramatic fall caused by an extreme stress event, such as the recent pandemic, will help protect airline yield.

In this case both the call option (index below 0.1307) and the put option (Index above 0.12) will not be exercised and the color payoff would be zero and the unhedged revenue would equal the hedged revenue of $11,097m (*0.1307 * 84,908,045,977)/* 10^6 *= $11,097m)*

Scenario 4: Index Value is 0.1500

In this scenario, the index is above the call exercise price of 0.1407 and the purchaser of the call option, sold by UAL will exercise the call option. UAL will lose from the collar contract.

Pay off from collar contract:

$((0.1407 - 0.1500) * 849080*100{,}000)/10^6 = -617m$

If UAL were unhedged, its total revenue would be

$((0.1500* 84{,}908{,}045{,}977)/10^6 = \$12{,}736m$

However if UAL were hedged, adding (subtracting) the collar payoff, the total for UAL would be:

Collar Payoff ($-617m) + Unhedged Revenue ($12,736m) = $12,119m.

UAL's Zero Cost collar strategy, therefore, will stabilize its revenue fluctuation between $12,119m and $10,189m with no upfront cost. More importantly, if UAL was unhedged, and the index declined from 0.1307 to 0.0025, UAL's revenue would have dropped to $212m from $11,097m or a 98.09% drop! However if UAL had hedged using a collar, the drop in revenue would be from $11,097m to $10,189m or only 8.08%. This shows the collar strategy using the *Skytra* Price Indices would offer considerable downside protection to UAL.

On the flip side, however, if the index rises above 0.1407, the call would be exercised and UAL would lose any upside revenue potential from being unhedged. Thus if the index rises to 0.1500, UAL's unhedged revenue would be $12,736m, while its hedged revenue would be $12,119m.

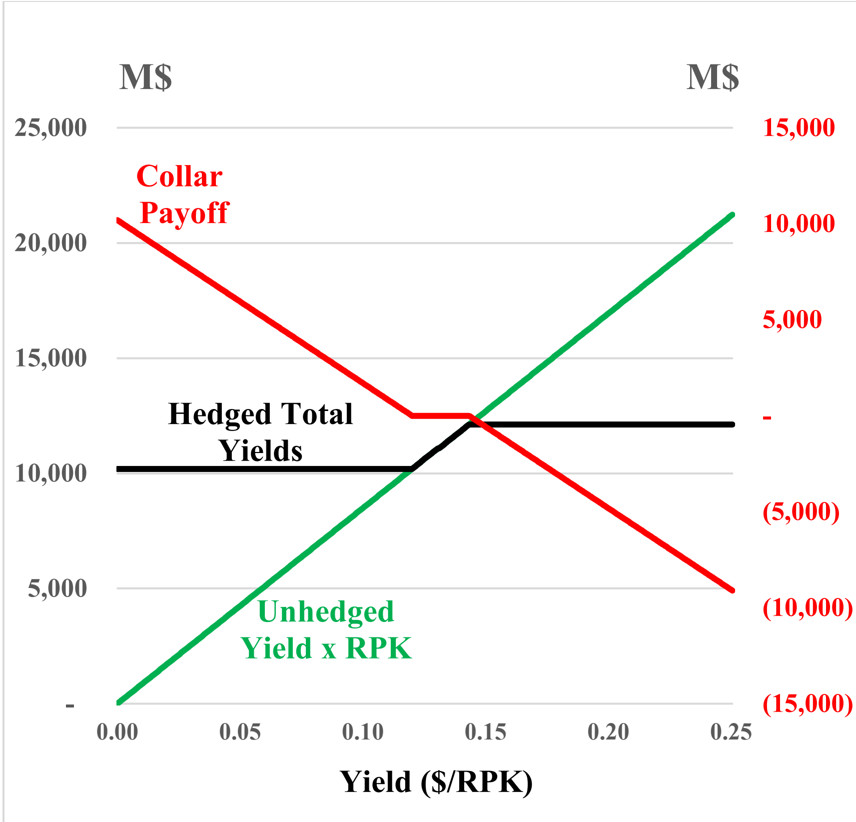
The net-cost-zero collar for UAL by selling an out-of-the-money call with a strike price of 0.1427 and buying an out-of-the-money put with a strike price of 0.1200 both with an asset price of 0.1307 under different scenarios is summarized below in Table 1.

Table 1: Payoffs from Hedging Yield for United Airlines using a Collar Strategy

Current Index Value	**Payoff (M$) Collar**	**Yield Unhedged**	**Yield Hedged using a Collar**
0.0025	9,977	212	10,189
0.1030	1,443	8,746	10,189
0.1307	-------	11,097	11,097
0.1500	(617)	12,736	12,119

Note: The payoffs are calculated assuming a call strike price of 0.1407 and a put strike price of 0.1200

Figure 1: Collar Payoff for United Airlines



SECTION 4: CONCLUSION AND FUTURE RESEARCH

This paper, the first in a series of research papers, introduced the airline industry and the economic and regulatory constraints under which it functions. The airline industry is a cyclical and capital-intensive industry prone to exogenous shocks. Airlines continually face many challenges including volatile oil prices, weak economic conditions, labor issues and other legacy issues. The industry is vulnerable to event risks such as terrorism, pandemics, political instability and natural disasters that lower passenger travel and could limit access to capital markets. Airline risk management strategies to date, have involved hedging their uncontrollable costs, such as, fuel, borrowing and currency fluctuations. Unfortunately, even its most volatile cost, fuel, only accounts for 20% to 30% of its overall cost. Effective risk management at the airlines should involve not only managing its risk from its cost side but must also take into account its revenue.

Until recently, however, airlines did not have the market infrastructure to hedge their yields. Recently, *Skytra*, a subsidiary of Airbus has proposed the needed infrastructure for airlines to hedge their yield.

This paper introduced the *Skytra* Price Indices and showed how a Zero Cost Collar strategy for UAL would have no upfront cost, but would offer considerable downside protection to decline in its yield, while giving up some upside potential if the index rises above the call strike price. In fact the analysis in this paper revealed that if UAL's TA yield fell by as much as 98%, UAL's hedged TA revenue would fall only by a mere 8%! The cost of this downside protection for UAL is that if the index settles above 0.1407, UAL's yield would be capped at $12,119m and they will lose any upside potential beyond this point by being hedged.

The next paper would explore the other side of the market. Whilst airlines deliver transportation as a service their customers are the entire world of air travelling passengers, represented in the majority by Online Travel Agents (OTAs), Travel Management Companies (TMCs) and Multi National Corporations (MNCs).

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