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Jet Fuel Hedge

MBAX 6270

Lufthansa Jet Fuel Hedging Strategy

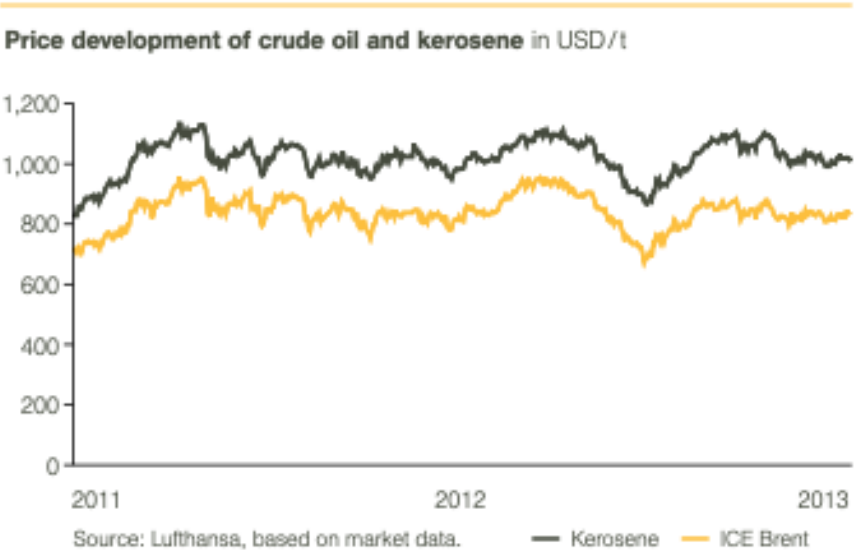
Lufthansa, better known as Deutsche Lufthansa Aktiengesellschaft, is a German aviation service that provides passenger as well as cargo air transportation services to 315 destinations in over 100 countries. Lufthansa's services are available in the Asia, North America, Scandinavia where the company provides a myriad of flights and connection programs. Deutsche Lufthansa is Europe's largest passenger airline. The global aviation group interacts with roughly 530 subsidiaries, as well as affiliated partners. Lufthansa's fleet consists of nearly 750 aircrafts. The company operates several other airliners such as Network Airlines which consists of Lufthansa Germany Airlines, SWISS, and Austrian Airlines. Additionally, another business segment of Lufthansa operates budget carriers such as Eurowings, Germanwings, and Eurowings Europe. For the clarity of bringing all financial strategies under one roof, the Lufthansa Group (LHA GR) will be evaluated to understand the companies approach to hedge their exposure to jet fuel prices. Over the past 10 yrs. Lufthansa has employed derivative strategies to help mitigate systematic risk through the hedging policies that are continually and permanently discussed in management board meetings. Notably, most of the change in Lufthansa's fuel hedging considerations came from the company's response to the Covid 19 pandemic.

In the last 10 years, Lufthansa has consistently taken action to help hedge expenses related to the fuel prices, exchange rate changes, and interest rate changes to minimize short-term financial risks for the business. The overall objective stated by Lufthansa is that their systematic hedging strategy surrounding fuel price and currency is to help reduce annual earnings volatility. To objectively analyze Lufthansa's hedging strategy and its evolution, the last 10 years of fuel hedges must be considered. The analysis of Lufthansa's fuel hedging was completed by taking the Annual Reports published by Lufthansa for 2021, 2016(5yr), and 2012(10yr). Each of the published 10k reports had significant sections dedicated to Lufthansa's systematic financial management as well as publications of profit and loss. At a basic level, Lufthansa controls for volatility in earning by averaging prices by means of layered hedging. The objective of the hedges is to smooth price fluctuations by means of rule-based processes. In the past 10 year all fuel hedges were executed over a time horizon of 24 months where 5 % exposure is hedged monthly. Thus, the maximum level hedge for Lufthansa is 85%.

A commodity that is frequently utilized by aviation companies such as Lufthansa is kerosene. Airplanes utilize kerosene-based fuels opposed to gasoline-based fuel for several reasons that are comprehensively beneficial. First and foremost, kerosene has a higher flash point and because of this an overall higher-octane rating which translate to more power overall in a single unit of kerosene when compared to gasoline. One of the predominant reasons airlines use kerosene is due to its power efficiency and lower price point in comparison to gasoline.

Likewise, the molecular composition of kerosene also has a much lower freezing point which performs better at higher altitudes where severely cold conditions are present. Lastly, kerosene is less viscous meaning it won't cause potential clogs in the engine. In conclusion, airlines closely monitor the level of both crude oil and kerosene to determine hedging strategy.

In 2012, the jet fuel crack which measures the difference in price between crude oil and kerosene, was particularly wide in 2012. The jet fuel crack moved between USD 15/barrel and USD 18/barrel, hitting a peak difference between crude oil and kerosene at USD 26.29 in October. The price of kerosene in 2012 rose by 7.8% year over year with an average price of USD 18.68/barrel. The movements in the price crack are closely monitored as they demonstrate that when prices increase the company is exposed to more potential losses. Instead of directly hedging kerosene (or Jet Fuel) based contracts Lufthansa hedges crude oil for purposes of market liquidity. The price crack chart is important because it illustrates why the utilization of a spread option is an important component of Lufthansa's fuel hedging strategy. A spread option derives its overall value from the spread or difference between the price levels of two (Crude and Kerosene) or more assets. Spread options are typically traded OTC. Spread options are utilized by Lufthansa regarding the crack spread that denotes the difference between the values of crude oil and kerosene. It should also be noted that the spread illustrates the profit margin for a refinery. Thus, Lufthansa can trade based on the expectations on whether the crack will strengthen or weaken. If the crack strengthens, Lufthansa is stating that the overall refining margin has increased while the overall value of crude oil prices is weaker. Likewise, the spread weakens if the value of refining drops below that of crude oil, refineries would be suffering a loss to produce refined products. The spread use to be quite low at around \$5 per barrel but now it has reached almost \$30 as illustrated above during the high point of USD 26.29 in October of 2012. Typically, airlines want the crack spread above the value of crude oil enough to incentivize production, but to minimize costs from the profit margin necessary to buy the commodity.



PRICE CRACK CHART

In 2012, the average price for kerosene was at USD 1026.48 per tonne, which increased Lufthansa's fuel costs by 17.8 percent or overall, a total of 1.1 billion EUR. Likewise, in 2016 Lufthansa consumed roughly 9.3 million tonnes of Kerosene costing roughly 4.9 billion. 2021 varied quite starkly as the Covid-19 pandemic stifled many of the operations of Lufthansa. Restricted operations lead the company to utilize 4.4 million tonnes of kerosene at a cost of 2409 million Euros. In 2012, Lufthansa claimed that fuel expenses consisted of over 20 % of total operating expenses, whereas in 2016 and 2021 the company simply claims that they are major items of expense that affect overall earnings.

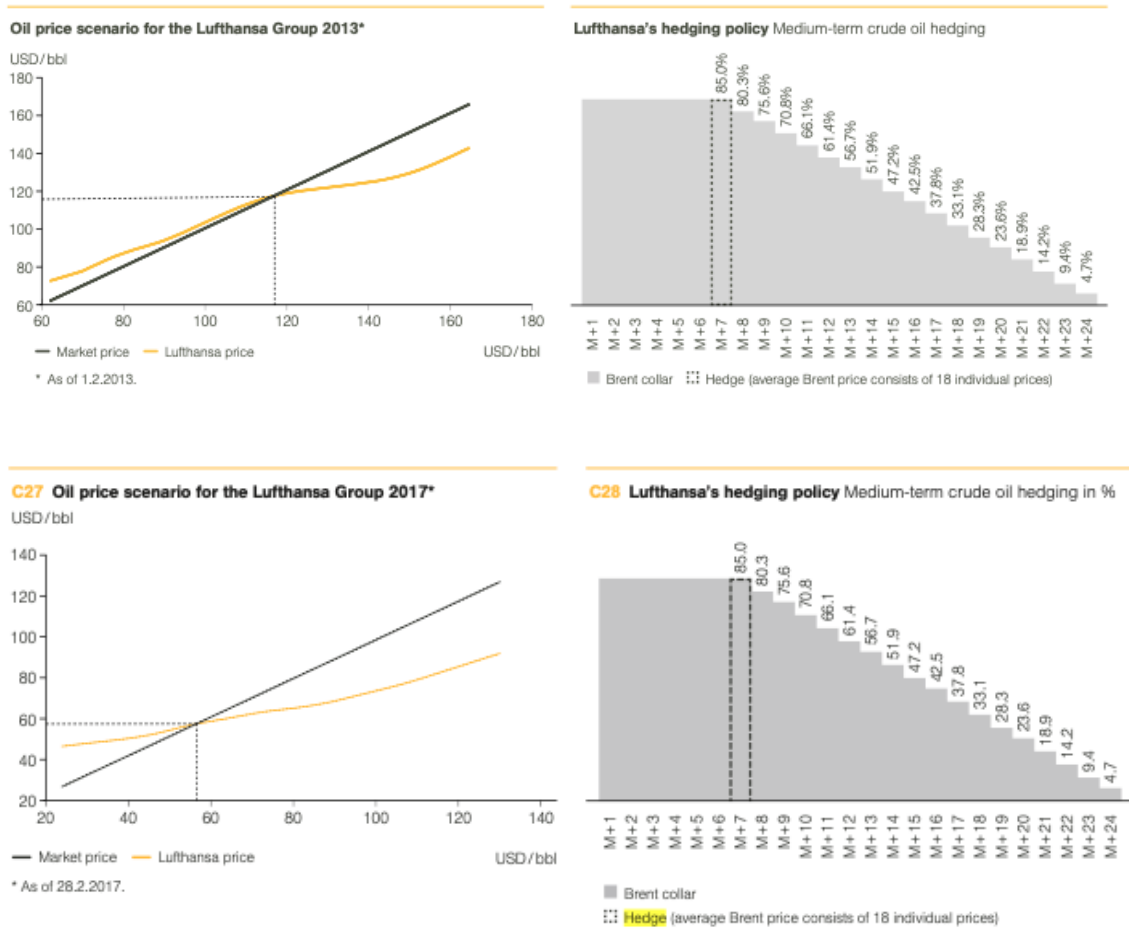
The price fluctuation impact varies for each year observed:

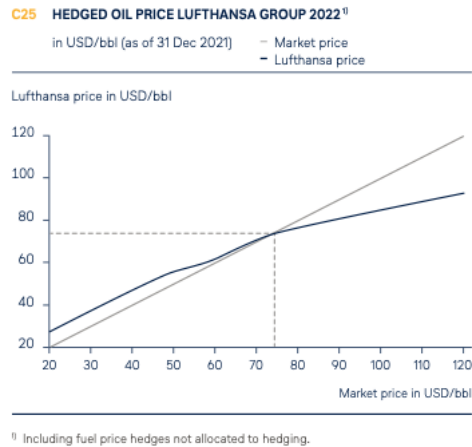
Fuel Price	+10 %	-10%
2012	302 EUR	-510 EUR
2016	259 EUR	-266 EUR
2020	261EUR	-361 EUR

Lufthansa's hedging strategy has remained quite similar over the past 10 years, however capacity adjustments had to be made in 2021 because of the pandemic. Across all years, Lufthansa mainly hedged crude oil through the utilization of a set of fixed rules and a process that would map out the out the average cost of crude oil prices over a set of time, typically 24 months. Lufthansa's fuel hedging strategy consisted of spread options and other hedging combinations that are predominantly for crude oil but on occasion is hedged for gas oil. An important aspect to consider when looking at Lufthansa's overall fuel hedging is their parent company status to many other organizations that also require hedged fuel. In response, Lufthansa claims that they hedge up to 85 percent depending on the company and all Lufthansa Passenger Airlines are hedged up to 65 percent. Lufthansa hedges up to 5 percent of exposure monthly for up to roughly 24 months through the utilization of spread options and other combinations of hedges. Specifically, Lufthansa has utilized hedges in the form of futures and options for the past 10 years to hedge both crude oil and kerosene in their forecasted fuel requirements. Specifically for crude oil and kerosene, the company remained a hedge level of around or near 75 percent of the forecasted required fuel in 2012 through 2017 using futures and options. When these contracts were entered, Lufthansa would typically hedge around roughly 30 percent of the next year simultaneously. However, this pattern was broken in 2021 with Covid-19 as capacity adjustments had to be made. Essentially this meant that some of the fuel hedging was not directly in tandem with hedged items. Fuel hedging was suspended by Lufthansa in the spring of 2020 and resumed a year later in spring of 2021. At the end of 2021, Lufthansa's crude oil and kerosene hedges were at roughly 60% for the entire group's jet fuel level requirement for 2022. Similarly, they hedged roughly 20% of 2023 simultaneously. Once again Lufthansa utilized futures and options. Thus, overall Lufthansa, according to the legend of Lufthansa hedging policy chart below, Lufthansa also utilizes a collar strategy on Brent Crude oil. A collar hedge strategy is akin to a call option strategy where both a call and put options are purchased. Such a situation would allow for an airline to use a call option to purchase

commodities at a future date for a price determined today, whereas the put option would allow the airline to sell a commodity in the future at a price determined today. The benefits of a collar hedge would utilize a put to protect Lufthansa from a decline in oil pricing if they had expected or anticipated that the price would increase. Likewise, in a collar option, Lufthansa could utilize a call option that gives them the right to purchase oil at a certain price for a certain amount of time if oil prices become too high.

Below are charts that represent Lufthansa's hedge price compared to the market and Lufthansa's overall hedging policy:





Likewise, Lufthansa recognizes that there are also tangible opportunities in newly developed production techniques that could be utilized for both crude and other common energy sources. Overall, the company believes that these advances could potentially have either a direct or indirect impact on the company's kerosene expenses by creating a reduction in both overall price and systematic volatility.

The overall fuel price risk evolved some for Lufthansa going from roughly 5% of exposure hedged every month for 24 months through spread options and through the combination of other hedges, to 4% of exposure every month for 24 months in 2021 where the target hedging level was 65% instead of 85%.

Fuel exposure

		2013	2014
Fuel requirement	in 1,000 tonnes	8,343	8,715
Hedges	in 1,000 tonnes	6,512	2,449
Hedging level	in %	78.1	28.1

T164 Fuel exposure

		2017	2018
Fuel requirement	in 1,000 tonnes	9,394	9,615
Hedges	in 1,000 tonnes	6,926	2,536
Hedging level	in %	74	26

T161 FUEL EXPOSURE

		2022	2023
Fuel requirement	in 1,000 tonnes	7,668	8,712
Hedges	in 1,000 tonnes	4,569	1,703
Hedging level	%	60	20
Hedging rate	USD/bbl	72.12	78.73

Another quite notable difference in exposure is Lufthansa's deviation from hedging roughly 20-30% of the following years expected fuel requirements, to hedging almost 80% of 2023's expected amount. Perhaps this could allude to some form of price prediction on Lufthansa's part considering the global pandemic and the impact it has had on many industries.

The second largest method employed by Lufthansa to hedge jet fuel costs is commodity swaps. Commodity swaps are utilized by Lufthansa to lock in specific set pricing for fuel they need, helping the company avoid systematic price swings. These contracts are traded between parties outside of an exchange and devoid of any oversight. Fuel hedging swaps that Lufthansa utilizes are based on crude oil, and the underlying. The floating part of the swap is held by Lufthansa as they are willing to pay a fixed price for the oil, whereas the fixed leg component is held by the oil suppliers who are protected against a decline in the value of the commodity over a period through an agreement to pay a floating rate. Thus, Lufthansa can lock in pricing and the oil producer can be protected from commodity price decline.

Another vital hedge is executed by Lufthansa to prevent additional systematic risk to earnings is currency hedging. The contracts that Lufthansa enters are priced in US dollars, however the company utilizes euros as they are based out of Germany and predominantly operate in Europe. Thus, the exchange rate between the euro/ US dollar can have a positive or a negative effect on fuel prices. Due to this risk, Lufthansa constantly is exposed to the US dollar and must be considered for all planned fuel requirements. To hedge currency risk associated with jet fuel, Lufthansa utilizes futures and currency options that involve the use of spread options that allow both the purchase and immediate sale of currency options in the same currency.

in €m	31.12.2012	31.12.2011
Fuel price hedges	14	141
Exchange rate hedges	16	163
Interest rate hedges	154	118

Another form of hedge that Lufthansa utilizes is interest rate swaps to help mitigate interest rate risks. The target for the company is to finance 85 percent of financial liabilities with floating rates of interest. The objective of this is to reduce long-term expenses from interest and help stabilize earnings volatility. Through interest rate swaps Lufthansa receives the flexibility as a swap can be specifically fitted to the fuel hedging needs of the company. Thus, because they are not standardized, they have more overall flexibility than futures. and it can help mitigate exposure by eliminating uncertain cash flows. Lufthansa utilizes interest rates swaps as it is an international company and will undoubtedly benefit from exchanging their fixed interest rate for a floating rate such as LIBOR or now SOFR. Both in 2012 and 2016, Lufthansa transferred interest rate swaps that had matured from equity to jet fuel expenses to reduce the total expense amount. In 2012 they transferred 259 million euros and in 2016 760 million euros.

Lufthansa's approach when compared to the textbooks framework which outlines the process of a Commodity Swap Valuation, is nearly identical to the method discussed. First and foremost, Lufthansa utilizes the futures curve that prevails on the transaction date when determining currency futures and swaps. The company states that currency futures and swaps are each individually discounted to the transaction date based on their respective future rates pared with the use of the appropriate interest rate curve. Option pricing models are used to determine the market value of options and currency-based options. Likewise, the overall fair value of the interest rates corresponds to their respective market value, which is calculated by discounting the expected future cash flows. Lufthansa utilizes discounting for interest rates because it considers both the market interest rate and the residual term into account.

Hedging Transactions to Mitigate balance sheet date, exchange rate, interest rate, and fuel price risks:

in €m	Fair value hedge		Cash flow hedge	
	Market value 31.12.2012	Market value 31.12.2011	Market value 31.12.2012	Market value 31.12.2011
Interest rate swaps	154	119	–	–
Spread options for fuel hedging	–	–	–	1
Hedging combinations for fuel hedging	–	–	14	139
Futures contracts for currency hedging	–	–2	16	120
Spread options for currency hedging	–	–	–	45
Total	154	117	30	305

T166 Derivative financial instruments used for hedging

in €m	31.12.2016		31.12.2015	
	Positive market value	Negative market value	Positive market value	Negative market value
Fair value hedge				
Interest rate swaps	98	0*	84	-1
Cash flow hedge				
Spread options for fuel hedging	62	-7	0*	-169
Swaps for fuel hedging	20	-	-	-14
Hedging combinations for fuel hedging	190	-30	-	-963
Futures contracts for currency hedging	1,297	-148	1,331	-296
Total	1,667	-185	1,415	-1,443
of which current	445	-146	382	-1,180

* Rounded below EUR 1m.

T163 DERIVATIVE FINANCIAL INSTRUMENTS USED FOR HEDGING AS OF 31 DEC 2021

in €m	Positive market value	Negative market value	Change in fair value of hedging instrument - designated risk	Change in fair value of hedging instrument - non-designated risk	Basis adjustment of hedged items	OCI - cash flow hedge reserve	OCI - cost of hedging	Ineffective portion of hedges - designated risk	Ineffective portion of hedges - non designated risk
Fair value hedge									
Interest rate hedges - interest rate swaps	133	-27	31	-	-30	-	-	1	-
Cash flow hedge									
Fuel hedging - options	305	-	146	159	-	144	156	2	3
Exchange rate hedging - forward transactions	937	-480	789	-137	-	681	-66	107	-71
Interest rate hedges - interest rate swaps	49	-	25	-	-	28	-	-3	-
Total	1,424	-507	991	22	-30	853	90	107	-68
of which current	535	-247							

Overall, Lufthansa deploys a comprehensive strategy to manage their exposure to systematic market risk, helping stabilize the costs associated with the utilization of a volatile commodity. Through various derivative strategies including the utilization of futures, calls, puts, collars, swaps, and spread options. Lufthansa can adequately minimize the costs that come with a business model that has a heavy dependency on a price volatile commodity. Thus, the Lufthansa Group can use a multitude of financial instruments to help hedge risks associated with currency, fuel price, and interest rate all of which occur with during ordinary business activities.