The Environmental Impact on the Airline Industry and Financial Analysis of Air China, China Southern Airlines, and China Eastern Airlines

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Abstract. This paper presents a comprehensive overview of the environmental impact on the airline industry, focusing on three of China's largest airlines - Air China, China Southern Airlines, and China Eastern Airlines. It provides a financial analysis of these airlines using the Capital Asset Pricing Model (CAPM). It includes a literature review to underline the importance of environmental factors on the industry and its financial performance. Scrutinizes the reciprocal relationship between the environment and the airline industry, focusing on how environmental factors influence the industry. The study involves reviewing the literature on physical environmental factors, policy-related factors, and the industry's response to these influences. The objective is to comprehensively understand the ecological impacts on the industry and the consequent strategic adjustments and technological innovations being undertaken.

Keywords: Environmental Impact; Airline Industry; Capital Asset Pricing Model

1. Introduction

The airline industry, a cornerstone of global commerce and connectivity, is significantly influenced by various environmental factors. This analysis aims to deepen the understanding of these impacts, highlighting the importance of developing adaptive strategies and fostering sustainability within the industry. The airline industry is critically affected by various environmental factors. This study deepens the understanding of these impacts and provides a financial analysis of Air China, China Southern Airlines, and China Eastern Airlines using the CAPM. The literature review section details the environmental effects on the airline industry and their financial implications.

This paper selected three companies in the airline industry for a more detailed analysis, which are Air China (CCA), China Southern Airlines (CSN), and China Eastern Airlines (CES)

Air China: Air China is the only Chinese airline with a global network spanning six continents. Air China's main hubs are Beijing Capital Airport (PEK), Shanghai Pudong Airport (PVG) and Chengdu Airport (CTU). Air China was founded in 1988. The majority of Air China's passengers are businesspeople and Chinese government officials who are willing to pay a premium price for Air China's quality service. Air China is tasked with providing special flights for Chinese leaders on their trips. Moreover, it handles the responsibility of arranging exclusive flights within China for international state and government leaders, highlighting Air China's unique position as the national flag carrier of the country. More than the support of the Chinese government over the years was needed, which is why Air China is aware of the need for continuous innovation.

China Southern Airlines: China Southern Airlines was established in 1988. China Southern Airlines has the most significant aircraft fleet, the most developed route network and passenger capacity in China. With more than 850 passenger and cargo aircraft, China Southern Airlines has the largest fleet in Asia. In addition, it has formed an extensive network that radiates to China, connects Europe and Oceania, and releases from Asia to North America, the Middle East and Africa. Over the years, China Southern has been committed to building Guangdong routes and making Guangzhou an international aviation hub. China Southern's target market is the Middle class / Upper middle class, with customers looking for punctuality and efficiency and thus choosing China Southern.

China Eastern Airlines: Headquartered in Shanghai, is among the trio of leading airline corporations in China. Its roots trace back to the inaugural squadron set up in Shanghai in January
1957, and it holds the distinction of being the first Chinese airline listed on the New York, Hong Kong, and Shanghai stock exchanges. The airline boasts the largest fleet of wide-bodied aircraft equipped with in-flight Wi-Fi across China and is recognized for its pioneering commercial and technical practices within the country. China Eastern operates from two main domestic centers located in Beijing and Shanghai, with an additional four airports. The airline has become a favorite choice among customers seeking economical fares. Despite this, its majority stakeholder is the Chinese government, creating a need for enhanced operational flexibility.

2. Literature Review

Ten pieces of academic literature provide a basis for understanding the impact of the environment on the aviation industry and its financial implications:

The economic costs of environmental factors such as weather phenomena are explored first. The second discusses the impact of climate change on the aviation industry, highlighting the increased operational costs due to unpredictable weather patterns [2]. The third highlights how rising global temperatures can affect aircraft performance and increase operating costs [3]. The fourth report highlights the risks to the aviation industry from increased extreme weather events due to climate change [4]. [5] The fifth analyzes the financial impact of environmental policies, such as the EU Emissions Trading Scheme, on the aviation industry. [6] The sixth discusses CORSIA under ICAO and its financial impact on airlines. [7] The economic benefits of investing in fuel-efficient aircraft and alternative fuels are highlighted in the seventh section. [8] The eighth discusses the potential for long-term operating cost savings from sustainable practices. [9] The financial impact and potential benefits of electrification of the airline industry are highlighted in Article IX. [10] Finally, the tenth article uses the CAPM to analyze the effects of environmental factors on the financial performance of Chinese airlines. [11]

3. Section I: Environmental Factors

The airline sector serves as a crucial cog in the worldwide economy, delivering global transportation solutions for both individuals and freight. The industry includes various types of airlines, including full-service, lower-cost, and cargo carriers. Airlines generate revenue from ticket sales, cargo transportation and supplementary services, such as catering, in-flight entertainment, and baggage handling. Intense competition, high operating costs, and sensitivity to external factors such as economic conditions, geopolitical events, and fuel prices characterize the airline industry. In addition, it operates in a complex regulatory environment where international and domestic aviation regulations govern safety standards, route approvals and other aspects of airline operations.

Due to global warming, resulting in the frequent occurrence of extreme weather events such as thunderstorms and heavy rainfall, as well as due to changes in atmospheric circulation, isobaric height, etc., especially climate change leads to the enhancement of the variability characteristics of severe weather, affecting the safety of civil aircraft flying on the route. Because of environmental protection, airlines are under tremendous pressure, and it is not a slight blow in the cost of fuel consumption.

Carbon Emissions: Air travel significantly contributes to greenhouse gas emissions, particularly carbon dioxide (CO2). As the airline industry grows, especially in emerging markets like China, the environmental impact of air travel is becoming an increasingly important issue. In response, airlines like Air China, China Southern Airlines, and China Eastern Airlines are investing in more fuel-efficient aircraft, implementing fuel-efficient operating practices, and exploring alternative fuel sources to reduce their environmental impact.

Climate Change: Climate change can potentially disrupt airline operations through more frequent and severe weather events, such as storms, floods and heat waves. This could lead to flight cancellations, delays, and increased airline costs, including Air China, China Southern Airlines, and
China Eastern Airlines. Adapting to these changes and managing the associated risks may require significant infrastructure, technology, and operational planning investments.

Noise Pollution: Noise pollution from aircraft operations can harm communities living near airports. To mitigate these impacts, airlines like Air China, China Southern Airlines, and China Eastern Airlines must comply with noise regulations, which may involve investing in quieter aircraft, rerouting flights, or implementing noise-reduction procedures.

Waste management: Airlines generate large amounts of waste during flight services, including food packaging, disposable tableware, and single-use plastics. Managing this waste in an environmentally responsible manner is a challenge for airlines, including Air China, China Southern Airlines, and China Eastern Airlines. These airlines must invest in more sustainable materials, waste reduction measures and recycling programs to minimize environmental impact.

Regulatory risks: Governments worldwide are implementing stricter environmental regulations to address the ecological impacts of the aviation industry. This may include emissions trading schemes, carbon taxes or stricter fuel efficiency standards. Compliance with these regulations could increase operating costs for airlines such as Air China, China Southern Airlines and China Eastern Airlines. In addition, it may require significant investments in new technologies and operating practices.

In summary, the airline industry, including Air China, China Southern Airlines and China Eastern Airlines, faces several environmental risks that could impact its operations and financial performance. Therefore, these risks must be managed positively to ensure the industry's long-term sustainability and commercial competitiveness.

The aviation industry depends on fossil fuels. Emissions from flights remain in the atmosphere and can warm it for several centuries. As emissions from aircraft are released high up in the atmosphere, they can have a substantial climate impact, triggering chemical responses and atmospheric effects that can heat up the globe. Since aviation is a significant source of greenhouse emissions, the carbon emissions of aviation traffic have become a topic of particular concern. Fuel tax subsidies have given the airline industry an inequitable advertising advantage over other transportation modes. Consumers do not receive the environmental cost of their aviation travel because the low fares do not reflect their environmental impact. The potential effects of climate change on business is valuable. It poses a risk to shareholders and will drag it down to lower profitability, putting much pressure on the airline industry to focus more on sustainable actions and develop and adjust its strategies.

Fortunately, the airline industry is well aware of the current problems and has set carbon emission targets, such as China's efforts to achieve the "double carbon" target and China's civil aviation industry, which accounts for a large share of carbon emissions, it is duty-bound to reduce carbon emissions. In 2021, Liu Shaoyong, Chairman of China Eastern Airlines Group, proposed "to develop a plan for China's civil aviation industry to achieve peak carbon emissions in 2030 and carbon neutrality in 2060". In addition, the airline industry is focusing on innovative sustainability and new technologies to reduce pollution. Establishment of the EU Emissions Trading System (EU ETS) and Emissions Reduction Scheme (CORSIA) and international aviation carbon offsets under the International Civil Aviation Organization (ICAO) illustrate the increasing pressure on airlines to reduce their carbon footprint (Scheelhaase & Grimme, 2017; Gössling et al., 2016). While crucial for global sustainability efforts, these policies impose additional operational and financial burdens on airlines. Despite these challenges, the industry increasingly embraces opportunities to innovate and become more sustainable. Many airlines invest in developing more fuel-efficient aircraft and alternative fuels (Lee et al., 2010; Winchester et al., 2013). Newer studies also note efforts toward the electrification of the aviation industry (Schäfer et al., 2019).

4. Section II: Financial Analysis Using CAPM

The Capital Asset Pricing Model (CAPM) is used to determine the expected return on investment, accounting for its systematic risk. This section presents a detailed analysis of Air China, China
Southern Airlines, and China Eastern Airlines using the CAPM. Key financial metrics are analyzed and compared, including the Beta values, risk-free rate, and market risk premium. Finally, the expected returns are calculated and interpreted in light of environmental impacts, as highlighted in the literature review.

To perform a more in-depth study, I did some calculations, and below I will explain the data we obtained. The data of these three companies for the past five years were downloaded from Yahoo Finance [1], the monthly average return of each company for the past five years was calculated, and the variance and standard deviation were calculated. Since all three companies selected are in China, the market return and risk-free return are computed using the CSI 300 index as the reference standard for market return and the return on Chinese government bonds as the reference standard for the risk-free rate. Surprisingly, the average market return has been lower than the average risk-free return over the past five years. It may reflect that China's economic situation has not been excellent in the last five years due to the epidemic and other factors. Then based on these figures above, this table was obtained by calculation. Based on this table, it is clear that all three airlines have not performed well in the last five years. Only Air China had a positive return, slightly above the market return. The other two companies have had negative monthly average returns over the past five years, and the EPS of all three companies is also harmful. The Sharpe ratios and expected returns for the three companies based on the CAPM model are also low, so if you look at the results of the reported financial analysis, the data in this table, it's probably not a good idea to put money into the airline industry, or even into the stock market, in the last few years. The reason why the data based on the previous five years is so poor could be related to the spread of the epidemic worldwide in recent years and the fact that China has implemented many policies to restrict the movement of people to stop the spread of the epidemic, which has undoubtedly impacted the airline industry's operations. It could also be related to the changing international situation, where with the outbreak of some wars, people have lowered their economic expectations for the future and prefer to save their money for unknown risks rather than spend it on travel. However, also consider that data does not mean everything, and it will be a challenge to quantify policy changes in terms of data. As China removes various restrictive policies based on the epidemic and takes various measures to stimulate consumption to encourage tourism, the status quo of the airline industry will change.

Table 1. The Sharpe ratios and expected returns for the three companies.

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<td>Beta</td>
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<tr>
<td>Expected return</td>
<td></td>
<td></td>
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<tr>
<td>Monthly average returns</td>
<td>0.96</td>
<td>1.08</td>
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<tr>
<td>Standard deviation</td>
<td>0.104276824</td>
<td>0.09061692</td>
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<tr>
<td>Sharp ratio</td>
<td>0.015845889</td>
<td>-0.038164454</td>
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<tr>
<td>EPS</td>
<td>($0.36)</td>
<td>($0.20)</td>
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<tr>
<td>Variance</td>
<td>0.01087441</td>
<td>0.008211426</td>
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<tr>
<td>Cov</td>
<td>Cov (1, 2)</td>
<td>Cov (1, 3)</td>
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<tr>
<td>Correlation coefficient</td>
<td>1.2</td>
<td>1.3</td>
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<td></td>
<td>1.087117404</td>
<td>-0.00462834</td>
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4.1. Investment Considerations:

Market growth: The Chinese aviation market is one of the fastest-growing markets in the world. With China's continued economic growth and the expansion of its middle class, demand for air travel is expected to increase. This growth potential could be a positive factor for investing in these airlines.
Government support: The Chinese government has supported the airline industry, providing various assistance and subsidies. This support could help airlines maintain their financial stability and competitiveness.

Competition: While these airlines are significant players in the Chinese market, they face competition from domestic and international carriers. Additionally, the growth of low-cost carriers and high-speed rail in China could impact their market share.

Global economic conditions and external factors: The airline industry is highly exposed to global economic conditions, geopolitical events, and other external factors such as oil prices and pandemics. These factors can significantly impact airlines' performance and should be considered when considering investing in them.

In conclusion, investing in Air China, China Southern Airlines, and China Eastern Airlines depends on your investment objectives, risk tolerance, and investment horizon. Therefore, conducting thorough research and considering various factors is essential before making an investment decision. In addition, consulting with a professional financial advisor for personalized guidance may also be beneficial.

5. Conclusion

Understanding the impacts of environmental factors on the airline industry is crucial for its future trajectory. While ecological policies and physical characteristics pose significant challenges, they also catalyze innovation and the transition to sustainability. The industry's future will likely hinge on its ability to navigate these challenges and capitalize on opportunities for sustainable growth. Understanding the impacts of environmental factors on the airline industry is crucial for its financial performance. Despite the challenges, the industry has opportunities for innovation and transition to sustainability. The future financial performance of airlines will likely depend on their ability to adapt to these challenges and capitalize on sustainable growth opportunities.

References


[7] IPCC. (2018). Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty
