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Navigating Financial Risk Management in Royal Caribbean Group: A Study of Commodity Price Risk

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Abstract

This work investigates the financial risk management (FRM) practises of Royal Caribbean Group (RCG), focusing on its management of commodity price. Using a combination of financial impact modelling and market valuation analysis, the study evaluates RCG's current hedging strategies, and its effectiveness in mitigating volatility, ensuring cash flow stability, and enhancing market confidence. Findings reveal that while RCG's existing commodity risk strategy effectively reduces the downside risk, it also limits potential gains when there are favourable market conditions. Recommendations include adopting alternative hedging instruments, such as collar options.

Keywords

Financial Risk Management, Market Risk, Hedging Strategies, Corporate Finance, Financial Instruments, Fuel Price Risk

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Disclaimer

This work is part of a group research project, and as such, first-person plural pronouns are applied. We used artificial intelligence tools to help us with syntax construction and grammar within this thesis, improving comprehensiveness. This is the sole use of artificial intelligence in our thesis. All calculations and reasoning are original work done by us, with all resources used listed properly.

1. Introduction

In 2021, when the global cruise industry was at a standstill, Royal Caribbean Group (RCG) faced over $18 billion in gross long-term debt, with a third of its total maturing up to 2023 (Royal Caribbean Cruises Ltd. 2022, 85), yet through a combination of strategic hedging, debt restructuring, and liquidity preservation (Barnes, Johnston, and Edgecliffe-Johnson 2022), the company not only weathered the storm but emerged with new plans for sustainable growth. As of December 6th, 2024, the strategies implemented seem to have had the intended result, with RCG's share price hitting an all-time high of $258.09, representing a year-to-date growth of 99%, while the Dow Jones U.S. Travel & Leisure Index has grown 24% (The Wall Street Journal 2024). Given the high valuation of the company's shares and with massive amounts of investors' money at stake, it's more critical than ever to evaluate whether RCG's financial risk management is foolproof or if there's space for improvement.

After suffering a significant setback during the COVID-19 pandemic, the cruise industry has significantly recovered. It was projected by the Cruise Lines International Association (CLIA) that 34.7 million passengers would travel in 2024, which is 17% more than in 2019 (CLIA 2024). This positive outlook, allied with the projections that by 2028, the cruise industry is expected to account for approximately 3.8% of the $1.9 trillion global vacation market (J.P. Morgan 2024), RCG seems to have the right backdrop to grow, assuming its exposure to financial risks is well managed.

Although the study of financial risk management (FRM) is and always has been essential for whatever company one chooses to look at, it becomes extremely relevant in today's global economy, where businesses face increasingly complex risks, with effective FRM helping organisations navigate financial threats such as market volatility, interest rate fluctuations, and economic crises, ensuring stability and continuity. Research indicates that companies with robust risk management frameworks are better equipped to withstand disruptions, reducing the chances of financial distress (IRMI 2021).

There's no doubt that in the aftermath of the 2008 financial crisis, various regulations and standards were set, mandating financial firms to follow more stringent FRM practises (e.g. Basel III, Dodd-Frank Act, DORA). However, for non-financial firms there hasn't been the same level of obligations put into place; still, an article from the British Journal of Economics found that non-financial firms use derivatives 10% more than financial companies (Lenee and Oki 2017).

In this thesis, we aim to provide a holistic understanding of how FRM affects RCG, considering both its direct impact on financial profitability (measured by operational profit and net income) and its influence on the company's market valuation (change in stock returns). We assess the effectiveness of RCG's strategies in managing key financial risks by examining their role in ensuring internal financial stability and shaping external market perceptions. Our analysis explores how risk management practices safeguard the company's profitability against fluctuations in fuel prices, interest rates, and exchange rates. We also investigate how effective risk management builds investor confidence, as reflected in the resilience of RCG's stock returns during periods of heightened volatility, but not only. By combining these perspectives, we evaluate the suitability of RCG's current strategies and offer recommendations for enhancing its long-term success.

In pursuing this objective, we consider two interconnected dimensions of how FRM impacts RCG. The first dimension focuses on the direct financial implications of risk management, viewed from

an accounting perspective. This involves exploring how well RCG's risk management practises address endogenous profitability—its ability to protect its financial results and maintain stable cash flows despite exposure to significant risks, such as fluctuations in fuel prices, interest rates, and exchange rates.

The second dimension takes a broader perspective, examining how RCG's FRM practises influence its external valuation, particularly through the lens of investor and consumer perceptions. In an industry characterised by inherent risks, robust risk management can create a sense of stability and reliability. When stakeholders perceive that RCG is effectively managing its risks, this confidence can be reflected in its stock returns. For example, if a significant risk factor, such as a change in fuel prices, occurs and RCG's stock price remains relatively unaffected, it may signal that investors trust the company's risk management framework to safeguard its operations and profitability. This perceived robustness can enhance investor sentiment, thereby benefiting the company's valuation and market performance.

This dual focus allows us to assess whether RCG's risk management practises are sufficient for its operational and financial needs and whether they contribute to building trust and confidence among its stakeholders in a way that supports long-term success.

We centred our thesis on commodity price risk and interest rate risk; for each of these, volatility and general effect on cashflows were examined, with a sensitivity analysis and worst-case scenario performed. Our findings indicate that while RCG's current strategy effectively manages risk, its strict focus on minimising volatility limited potential advantages. We recommend exploring collar options for fuel exposure and indexing new loans to EURIBOR instead of SOFR.

1.1. Company overview

The history of RCG has been one of success. The cruise company was founded in 1968 (then Royal Caribbean Cruises (RCC)) by three Norwegian ship owners and an American hospitality

entrepreneur, intending to cover the U.S.'s rapidly growing cruise market (Royal Caribbean Group 2024; Wright 2023). Launching its first boat in the sea in 1970, it quickly realised there was a need to expand, adding 3 other vessels to its portfolio of ships in the next 12 years (with 2 of these newer ships being amongst the largest cruise ships in the world at the time) (Wright 2023; Smith and Brotherton 2013).

Being a highly innovative company RCC has stood out. From pioneering the first-ever cruise ship enlargement to aiming to have the world's largest cruise ship (a record that has since been consecutively achieved), to leasing islands to have private destinations for guests (Smith and Brotherton 2013; Wright 2023).

Incorporated in Liberia but with headquarters in Miami, Florida (U.S.), the enterprise has been public since 1993, being quoted on the New York Stock Exchange (NYSE) under the ticker RCL (Royal Caribbean Cruises Ltd. 2024a; Wright 2023). Over time RCC merged with several smaller firms, opening the way for new market segments and locations. This implied changes in its organisation, ultimately leading to name changes and a unique structure.

Nowadays, this structure revolves around having the parent company that owns multiple cruise brands (Appendix 1), overseeing its strategies, finances, and operations, as well as handling corporate governance, investor relations and overall risk management. Each of these brands has its own identity, target audience, and operational focus; however, RCG manages these brands as a single business to maximise shareholder value, given their similarity in overall processes and systems as well as the regulatory environment.

Still, when it comes to RCG, naturally people would think of Royal Caribbean International (RCI, also known as Royal Caribbean Cruises) as it is the flagship cruise line and the market leader in 2022, with 20% of the market share, followed by Norwegian Cruise Line Holdings and Carnival Cruise Line, both with 11%. Also on the top 10 leading cruise lines worldwide is TUI Cruises, with

3% of the market share, a brand for which RCG has a joint venture with the TUI Group, and Hapag-Lloyd Cruises (Statista 2024c). Meaning, in the shipping sector, specifically the cruise sub-sector to which RCG belongs, it stands irrevocably as a leader, with a consolidated position over the years. Its operations span globally through its presence on four continents and adapting its fleet deployment to seasonal demand and market trends in each region, a key insight for studying the firm's FRM strategies. Also relevant is the portion of revenues coming from these operations worldwide, with 25% coming exclusively from outside of North America in the first semester of 2024 (Royal Caribbean Cruises Ltd. 2024b).

In general, RCG has had strong financial years with successful post-pandemic recovery and growth, totalling $13.9 billion in revenues in 2023, which was sustained by robust consumer demand for its brands. Meanwhile, Carnival Corporation, which has been focused on deleveraging, posted $21.6 billion in revenues for 2023 (Statista 2024a) and Norwegian Cruise Line Holdings included about $8.5 billion (Statista 2024b). By growing its fleet and implementing strategic initiatives, RCG remains at the forefront of profitability and innovation in the sector as it rebounds more strongly than average across the industry. The broader cruise industry also experienced growth in 2023, but RCG largely outshined many peers because of a premium-orientated strategy, creatively designed vessels and several operational execution advantages, allowing them to maintain a certain consistency over the last 10 years (Poirot 2024).

RCG continues to innovate with new ships like Icon of the Seas, launched in 2024, and Utopia of the Seas, both designed to increase capacity and improve energy efficiency. The firm is also exploring sustainable technologies to reduce its environmental impact, aligning with industry trends toward greener cruising (Royal Caribbean Cruises Ltd. 2023). Additionally, by partnering with companies like SpaceX for their Starlink product – which improves onboard internet – RCG continuously works on enhancing guest experiences. The company also owns resorts like Perfect

Day at CocoCay and collaborates with global ports to streamline logistics and expand its market reach (Royal Caribbean Group 2022a).

1.2. Financial Risk Management

1.2.1. The Theory

In the perfect world envisioned by Modigliani-Miller, where taxes, transaction costs, bankruptcy costs, and agency costs do not exist, markets are perfect, and investors behave rationally, FRM would be unnecessary. Investors would hedge their own risk or diversify their exposure, rendering firms' risk management redundant, the cost of capital would remain constant no matter what risk management strategies a firm uses, and volatility would not have any associated costs.

With its imperfections, the real world makes all these assumptions crumble, taxes, as well as transaction, bankruptcy and agency costs, exist, markets are imperfect, and investors are sometimes irrational. In this reality, FRM becomes essential (Hommel 2005).

It is due to Modigliani-Miller's assumptions not holding that FRM can make such a difference for companies because it involves a detailed and structured process of identifying, assessing, and mitigating financial risks that typically stem from market volatility and that could impact a company's performance. Effective FRM ensures that a company can navigate these risks in a way that protects its value and stabilises its cash flows. As highlighted by Christoffersen (2011), the key objective of FRM is to manage uncertainty in financial markets while optimising business performance, essentially through hedging.

By strategically using financial instruments like derivatives — such as options, futures, forwards and swaps—to hedge against adverse market movements, firms can potentially mitigate risks and protect shareholder value (Deloitte 2018). Traditionally, FRM has been based on a variance-minimisation model, where the goal is to reduce the volatility of a company's future cash flow.

However, there are some propositions of FRM also being concerned with preventing the worst-case financial scenarios that could push a company into distress. In these cases, where the worst-case scenario is a drop in market prices, companies might purchase "out-of-the-money" put options to shield against large potential losses, ensuring that they are prepared for rare but severe negative outcomes, while still benefiting from positive market movements (Stulz 2022).

Moreover, some companies view FRM as more than just a defensive strategy. By actively managing risks, they can also capitalise on opportunities during periods of market turbulence, potentially increasing profitability. Thus, FRM not only protects against financial threats but can also serve as a tool for enhancing a company's strategic positioning in the market, as long as these companies have a comparative advantage in doing so (Stulz 2022). Hence, whether the goal of the firm is to protect itself against financial threats or to improve its strategic positioning, using derivative instruments, that is by entering into financial contracts whose value changes according to an underlying asset, which is usually the asset the company wishes to hedge against, firms manage their risk exposure.

One way to hedge is to take a long or short position against an asset. A long hedge position is a tactic used when firms want to guard against future price increases because they will need to source the asset at a future price, as opposed to short hedging, which is used when firms already own the asset and need to guard against future price declines. In both situations, the hedge will prevent the company's margins from declining and offset the loss of rising and falling markets (Deloitte 2018). Essentially, what is being performed when companies hedge is a trade on specific financial risks with other institutions, who are more predisposed and likely better equipped to take on and manage these risks. Thus, the kind of protection that might be offered in a derivatives contract enables a firm to choose, or at the very least manage, which form of risk it wishes to be exposed to (International Monetary Fund 2000).

1.2.2. Literature Review

In this section, by highlighting what has already been explored before in the field, we aim to pinpoint the areas that require further studies to be done, and hence where the gaps in knowledge lie and that we want to fill when it comes to FRM.

Broadly speaking, historically FRM has been focused on capturing and mitigating the complexities of the financial markets, not only for firms but also for investors. Particularly quantitative-based models are much more developed — in terms of risk measurement parameters, hedging models and solvency/liquidity requirements — for either investors or financial firms, leaving out of the picture the similar numerical approach for nonfinancial firms. For example, to mention FRM and not bring up the 2008 financial crisis would be to tell an incomplete story, given that it established the significance of risk analysis in financial firms; however, RCG is not a financial firm, and hence its practice of FRM has a distinct place in the literature.

To situate this thesis within the broader academic conversation, Graham and Rogers (2002) found that hedging can add about 1.1% to market value by increasing debt capacity, while Guay and Kothari (2003), indicated that the cash flows generated by hedge portfolios are modest and unlikely to account for large changes in value. Bartram, Brown, and Conrad (2011) have also examined the role of derivatives in financial risk management, finding that firms using these instruments effectively reduce their risk exposure, particularly during market downturns. Such firms often operate in commodity-based industries or have substantial foreign operations, making them more vulnerable to exchange rates, interest rate, and commodity price risks. Derivative users experience significantly lower cash flow and stock return volatility compared to non-users and show reduced systematic risk. Despite being larger and older, these firms exhibit a slightly lower unadjusted Tobin’s q, suggesting that while derivatives mitigate volatility, their use may not directly enhance firm valuation.

However, at a granular level, the cruise business has historically lacked in-depth research, in particular related to financial risk management, with most of the studies alike focusing on comparable sectors like the shipping industry or the airline sector. In recent years, however, some empirical research and theoretical developments have started to appear. Caiazza (2012) briefly explored the strategies and financial instruments employed by key players in the industry. The journal article starts by presenting the challenges faced, continuing with a comparative analysis of the main financial risk management tools used by a representative cross-section – RCG, Carnival Corporation and Star Cruises. More recently, Wu (2024) presented a deeper investigation, emphasising the high capital requirements and revenue fluctuations in this substantially integrated industry. Using financial ratios and the Entropy TOPSIS method, Wu evaluated the solvency, profitability, and operational efficiency of major firms in the business (RCG, Carnival Corporation, and Norwegian Cruise Line). Suggesting companies should have an internal look at financial performance to understand the drivers that aid in investment and management decision-making. Finally, it proposes three tactics to enhance performance: fleet optimisation, shareholder benefits, and fuel hedging.

Consequently, this thesis builds upon previous work by exploring on the one hand, a relatively straightforward regression model to explain the impact of FRM on a nonfinancial company's market valuation and on the other, by laying out the strategy to follow when one wishes to quantify the financial impact of specific FRM strategies being performed by a company using only publicly available data, as well as, by suggesting, based on this evaluation, potential strategy improvement. This approach is possible by synthesising various other perspectives discussed in the FRM field.

1.2.3. For RCG

To really be able to study the way RCG does FRM, we need to explore the ways and hence the types of financial risk the company is exposed to. For the purpose of this work, when we refer to

types of financial risk and their definition, it is to the portion of these risks that applies to nonfinancial firms. The way nonfinancial firms might be exposed in the financial risk landscape, can be divided into four core types of risks generally accepted – influenced by internal decisions such as credit and liquidity risk, and mainly external factors like market and operational risk - that pose significant challenges to the company's capability of maintaining its operations, financing new initiatives, and fulfilling debt obligations (GARP 2022). RCG is not exempt from these risks and the financial instability their interplay may provoke, as such it adds value to explore their relationship with the firm specifically (Royal Caribbean Cruises Ltd. 2024a, 28).

To begin with, there are macroeconomic factors that create risk exposures that are independent of what any firm is able to control, like the unexpected risk of incurring losses due to fluctuations in fair values or future cash flows because of changes in market prices (Hunziker 2012). RCG faces substantial exposure to market risk from exchange rates, fuel prices, and interest rate fluctuations, all of which add further complexity to its financial risk profile.

For once, changes in currency exchange rates can affect the value of earnings in foreign markets. A strong U.S. dollar can diminish the value of revenues generated in other currencies, impacting the company’s bottom line. Another factor comes from RCG’s significant amount of foreign-denominated debt; it ended 2023 with $5.5 billion in export credit facilities, with the final size of each facility depending on fluctuations in the EUR/USD exchange rate. This currency exposure is a persistent source of risk, as RCG operates globally and derives revenue from various markets with differing economic conditions (Royal Caribbean Cruises Ltd. 2024a, 29-32).

Fuel prices represent another critical factor, as not only market risk exposure but also as they play a substantial role in RCG's operational expenses, and hence could also be considered a source of operational risk. Fuel costs are inherently volatile, influenced by geopolitical factors, supply chain disruptions, and regulatory shifts, such as the push for environmentally sustainable fuels. Given

that fuel costs represent around 15% of RCG's operating expenses, any increase directly decreases operational profit, thereby reducing overall profitability, or even in a more extreme situation puts pause to operations. RCG's ability to hedge against fuel price volatility offers some buffer, but hedging might only partially mitigate the impact, as price spikes or regulatory fuel restrictions could still lead to substantial cost increases. The compliance with new fuel regulations adds further uncertainty in terms of cost implications for RCG's operational strategy; still, it is something that RCG is working towards; which might add more hedging strategies on new underlying assets, and hence it could increase the burden and complexity of FRM for the firm (Royal Caribbean Cruises Ltd. 2024a, 30-32).

Finally, interest rate fluctuations represent another layer of market risk that intensifies RCG's financial vulnerability, particularly given its substantial debt obligations. As of the end of 2023, $3.7 billion of RCG's debt was tied to variable interest rates, exposing the company to increased interest expenses and hence a higher cost of servicing debt if rates rise. Although RCG utilises interest rate swap agreements to manage some of this exposure, these strategies might not entirely shield the company from rising costs if market rates surge unexpectedly (Royal Caribbean Cruises Ltd. 2024a, 32).

Together, these factors create a complex web of market-driven risk intertwined with operational risk that RCG must continuously manage. These risks interlink with credit and liquidity challenges, as higher expenses and fluctuating revenues can strain cash flow and complicate debt servicing. These latter risks depend more on the strategic choices RCG makes and internal risk factors.

It is debatable whether RCG's exposure to credit risk is significant. Looking at this risk as the danger of counterparty non-performance in terms of the derivative agreements, credit facilities and new ship progress payment guarantees the firm has in place with counterparties, then it is relevant to highlight the set of guidelines that RCG follows about instrument maturities and credit ratings

to preserve liquidity and safety. Then we can argue that the selection RCG does, on the financial and other institutions it conducts significant business with, based on their credit ratings and on not being individually dependent on just a few institutions, reduces the likelihood of facing losses from non-performance. And hence agree with the fact that RCG does not face meaningful credit risk, more specifically concentration and default, under the current practises it adheres to.

Evaluating liquidity risk in the firm, however, leaves no doubt as to the importance of it and to the role it plays in FRM done by RCG. For once, the company's reliance on debt financing intensifies the risk that RCG might not have enough readily available cash to cover short-term obligations. RCG historically draws on a mix of cash flow, available credit facilities and the issuance of debt or equity to meet its financing needs (Royal Caribbean Cruises Ltd. 2024a, 28). A significant part of the financial challenge RCG faces stems from the firm's existing heavy debt obligations. As of 31st of December 2023, the company carries a $21.5 billion in total debt, which requires ongoing cash flows to meet interest payments and repay principal, consuming a large portion of operational cash flow. Compounding these issues is the possibility that RCG may need to take on even more debt to meet its financial obligations or to fund future growth.

Building on the rationale outlined above, our analysis will focus primarily on the exposures to fuel prices, interest rates, and exchange rates, as these are the key drivers that significantly influence market risk, operational risk and consequently liquidity risk. The perspective that when managed effectively, these exposures have the potential to yield the most substantial benefits for RCG aligns closely with the priorities the firm emphasises in its 2023 10-K report as well as our own: that once the management of these risks is stabilised, this management can act as the cornerstone for improving RCG's liquidity and ensuring long-term resilience.

Beyond the main scope of this work, but still important to acknowledge are other non-financial risks that RCG faces, which, while not directly financial in origin, will have tangible financial

implications in the coming years. Climate risks and regulatory changes stand to reshape the types of fuel RCG is permitted to use and the associated costs. These risks are directly tied to global environmental goals and industry-specific mandates that seek to reduce emissions and minimise the environmental footprint of cruise operators. As we will mention in more detail in the commodity price risk section, RCG has already begun to address these challenges. This intersection of climate and financial risk underscores the broader context in which RCG operates, where external pressures and internal adaptations must be closely aligned; hence, understanding these additional dimensions provides a fuller picture of RCG's risk landscape.

2. Data architecture and research approach

To achieve the goal of this work we reviewed a variety of sources, including RCG's annual 10-K filings with the Security and Exchange Commission (SEC) and recent industry trends. This allowed us to understand the company's historical practises and future objectives as disclosed in its financial reports and strategic statements.

2.1. Data

The two main models we have used require different types of data; one utilises internal data reported by the company plus some market data and the other exclusively uses market data.

For the financial impact model – which focuses on the company's financial statements and examines the direct impact of hedging strategies on reported internal metrics – we have collected information from various sources for the last 10-year period. Data regarding RCG's accounting was retrieved from the annual mandatory SEC filing reports, available on the company's website (the same reports can also be obtained from the SEC's website). Given that there is not a file with the firm's financial statements for the complete period available we have aggregated the data in a

single master file. For each year, we have used the latest data available to obtain the most accurate view possible, given that there may be changes after the reporting period.

When it comes to auxiliary data such as fuel prices and interest rates, we chose to use datasets from reputable sources. For the relevant fuel, we collected annual price averages from the U.S. Energy Information Administration (EIA), performing the necessary adjustments to guarantee that both RCG's and EIA's information were in the same unit (dollars per metric tonne). The same information was taken for West Texas Intermediate Crude Oil Spot Price (a key benchmark widely used in the energy sector and financial markets) and transformed to perform comparisons (U.S. Energy Information Administration, 2024). Additionally, benchmark LNG prices were also collected from the Federal Reserve Bank of St. Louis (FRED 2024a).

To explore the interest rate exposure that RCG faces, we retrieved three different interest rate benchmarks based on the company's debt profile and its interest rate swap agreements. The USD LIBOR — mostly tied to RCG's revolving credit facilities, senior notes and term loans— has been extracted from two separate datasets, for the 6-month rate. From Macrotrends Data, we collected data from 2012 through 2020, corresponding to the rates for each month (Macro Trends 2020) and the more recent data from 2021 up until June 2024, is from FedPrimeRate.com (2024). It is relevant to mention that while the LIBOR has been historically used for the global interest rate benchmark, it was phased out gradually, and as of June 30th of 2024, it was discontinued due to reliability concerns (Marquit 2023), with the U.S. Federal Reserve's (FED) preferred alternative being a benchmark more closely defined as a risk-free rate, such as the Secured Overnight Financing Rate (SOFR), specifically the variant used as the reference rate for financial contracts pertaining to future fluctuations is the Term SOFR (J.P. Morgan 2022).

Since RCG completed its transition from LIBOR to SOFR for substantially all of its interest rate swap agreements by the 31st of December of 2023 (Royal Caribbean Cruises Ltd. 2024a, 49), with

the transition starting in the beginning of 2023, we opted for only using LIBOR for any back testing done on interest rate exposure until the 31st of December of 2022. While for evaluating potential strategies for the periods after this date, we have used the historical SOFR for 2023 until October 2024, collected from the Federal Reserve Bank of St. Louis dataset (FRED 2024b), and then the Term SOFR forward curve as the benchmark interest rate for determining the interest paid on future debt obligations, collected from Blue Gamma (2024) for the period after the 31st of October 2024 (Appendix 2). Finally, the EURIBOR was also obtained from the ECB Data Portal, mostly due to the unsecured term loans RCG has linked to this rate. This dataset contains the 6-month EURIBOR rates corresponding to the average of the observations in each month, from 2012 through 2024 (European Central Bank 2024a). To estimate the performance of RCG on its interest rate swap agreements, we needed to obtain the Euribor forward rates as the benchmarks for this agreement; we collected them from the Chatham Financial dataset for the next 5 years (Appendix 3) (Chatham Financial 2024).

For the market valuation model and the subsequent regression developed using daily data, we utilised an index for market sentiment and proxy variables for fuel, interest rate, exchange rate and market sentiment, namely the United States Oil Fund, LP (USO), Invesco DB U.S. Dollar Index Bullish EFT (UUP), MSCI World Index, United States 6-Month Bond Yield (US6M) and Germany 6-Month Bond Yield (Germany Yield) (Investing.com 2024f; Investing.com 2024e; Investing.com 2024a; Investing.com 2024h; Investing.com 2024c).

These regressions also utilise RCG’s stock historical data as well as Carnival Corporation's stock historical data (Investing.com 2024g; Investing.com 2024b). For other experiments done inside the scope of our market valuation model, we have also included data for iShares 1-3 Year Treasury Bond ETF (SHY) (Nasdaq, n.d.), along with other internal RCG factors. Given the daily frequency of this data, for the days in which information was missing (either due to the market being closed

on one exchange and not the other, or because trading in the exchange was suspended), we only considered the days in which all the variables had information.

In the running of the financial impact model described above we have encountered a number of challenges that ended up having some impact on our study, such as differences in the arrangement of information, missing information and outliers. In the next paragraph, we will encompass these difficulties, how they might affect our decisions and how we solved them.

The first challenge encountered was the difference in information disclosed from year to year, specifically in 2019 and in 2021, reporting methods differ from previous ones. To overcome this, we made estimations (applying historical growth rates) where possible; when these were not feasible, we relied on assumptions (Appendix 4). Another challenge was that RCG had been invested in many businesses that were later incorporated into the firm and then extinguished, leading to gaps in the financial reports, like in the previous points we dealt with it, by estimating and assuming when necessary. Finally, we must mention that RCG, as well as the remaining cruise industry, was deeply affected by the Covid-19 global pandemic. The company's operations stopped in March 2020 and only progressively restarted in late 2021, hence this portion of the data constitutes an outlier, with some values missing and others not following the usual pattern of ordinary operations.

2.2. Methodology

The market valuation model used in this work consists of looking at the exogenous variables to the company, essentially market data, to explain the influence they could have on the stock returns of RCG, which is a measure of value. Hence, the statistical regression model employed seeks to analyse the sensitivity of RCG's daily stock returns to key financial risk factors, leveraging a set of carefully selected independent variables. The dependent variable in the model is the daily change in RCG's stock returns, calculated as the percentage change from the previous trading day. This

measure captures the short-term movements in RCG's stock price, which are presumed to reflect the market's assessment of the company's exposure to various risk factors.

The independent variables are proxies for RCG's financial risk exposures and control for broader market sentiment. First, daily changes in the price of the USO are included as a proxy for fuel price risk. To account for interest rate risk, two measures are incorporated: the daily variation in yields of U.S. 6-month Treasury bonds, representing interest rate exposure for RCG's USD-denominated debt benchmarked to SOFR, and the daily variation in yields of Germany 6-month Treasury bonds, which serves as a proxy for EUR-denominated debt benchmarked to EURIBOR. These yield changes align closely with the semi-annual amortisation schedules of RCG's loans, and the swaps used to hedge this exposure, which we will explain in greater detail in the section dedicated to interest rate risk. To capture the company's exposure to exchange rate risk, the daily changes in the price of the UUP are used. UUP reflects the fluctuations in the value of the USD relative to a basket of world currencies via a USDX futures contract, which is significant given RCG's multinational operations and financial obligations in EUR. Lastly, to control for the influence of broader market sentiment and consumer confidence, the model includes daily changes in the price of the MSCI World Index in USD. This variable accounts for the general movement in global equity markets, ensuring that the coefficients of the risk-related variables are more reflective of specific hedging or risk management practises rather than broad market trends. A caveat is that RCG's stock is part of this index with a weight of 0.06%, however, given its dispersion, the effect from RCG on the index is minimal (MarketScreener 2024).

This regression framework is designed to isolate and quantify the impact of these financial risk factors on RCG's stock returns while controlling for external market influences. By analysing the coefficients and significance levels of each variable, we aim to shed light on the impact of RCG's risk management strategies on market valuation, either because it actually impacts the company's

financial fundamentals or the investor/consumer sentiment. However, before arriving at the final model that seems to best translate this relationship, we constructed various other regressions, whose relationships turned out to be statistically insignificant but still provided some insights. These regressions included data from annual returns of USO, SHY and FXE as independent variables to try and explain annual revenue growth, annual EBITDA margin, and annual growth of net income, producing three additional regression models we will also evaluate (Investing.com 2024f; Nasdaq n.d.; Investing.com 2024d). Following the same logic, we tried to determine the impact of quarterly growth rates of average fuel prices, interest rates and exchange rates on quarterly net income growth.

Before delving into the next section, it's important to clarify our approach to hedging effectiveness. While volatility reduction is often used as a measure of hedging effectiveness, it is not the sole metric considered in this analysis. For RCG, the use of swaps to convert variable expenses into fixed ones inherently results in lower volatility. While we confirm and highlight this success, we employed an additional approach to evaluate and rank hedging strategies by analysing the cash flows generated by the swaps themselves.

3. Financial Risk Exposures

While the obvious goal for FRM in all companies is to control fluctuations in cash flows resulting from risk exposures, RCG has set some additional objectives to achieve with its chosen FRM strategy, besides cash flow control, which we will take into account when suggesting improvements. The first additional priority is to maintain a strong liquidity position, important not only due to the firm's strict debt covenants but also because of the nature of the day-to-day operations of the cruise industry. This position would allow RCG to improve the creditworthiness of the business, which contributes towards the next objective of reaching an unsecured balance sheet and a balanced debt

maturity profile, which in turn might help reduce interest rate expenses all through the use of financial derivatives (Royal Caribbean Cruises Ltd. 2024a, 5).

The following sections provide an overall analysis of the influence of the current hedging strategies done by RCG on its stock returns, followed by an in-depth analysis of each risk in terms of how it is currently being hedged by RCG and its financial impacts (through volatility control and positive cash flow hedges). Based on this, we provide recommendations for improvement for the two primary risk exposures: commodity price and interest rate.

3.1. Market Valuation Model

To understand if and how each of these risks affects RCG, we performed a multilinear regression analysis to explain variations in daily stock returns over the last 10 years through changes in the daily prices of USO (a proxy for fuel price), UUP (a proxy for the exchange rate), MSCI World Index (proxy for the market), US6M (proxy for LIBOR/SOFR) and Germany Yield (proxy for EURIBOR) with the results being as follows:

Regression Statistics	
Multiple R	0.56909689
R Square	0.32387127
Adjusted R Square	0.3225103
Standard Error	0.02672449
Observations	2490

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.0004521	0.000536866	0.84211	0.39980753	-0.000600651	0.00150485
USO	-0.02012604	0.022713395	-0.886087	0.37565655	-0.064665177	0.0244131
UUP	0.07511414	0.114240053	0.657511	0.51091306	-0.148901405	0.299129683
MSCI World	1.94959439	0.060266442	32.34959	6.828E-192	1.831416753	2.06777203
US6M	-0.01340656	0.00599991	-2.23446	0.02554146	-0.025171897	-0.001641217
Germany Yield	-0.00640058	0.002606961	-2.455188	0.01414919	-0.011512618	-0.001288538

Figure 1- RCG's market valuation model

Starting with the R-squared, the value of 0.3238 indicates that approximately 32.38% of the variation in RCG's daily stock returns is explained by the regression model. While this shows a moderate level of explanatory power, it also implies that other external factors not included in the model likely influence RCG's stock performance, which is also valid due to the complexity

involving the prediction of stock returns. At the same time the intercept, at 0.00045, is not statistically significant, indicating no significant baseline return independent of the included variables.

The MSCI World coefficient of 1.95, represents the standard CAPM beta, which measures RCG's systematic risk relative to the overall market, with a beta significantly greater than 1, RCG's stock is almost twice as sensitive to market movements as the market average. This heightened sensitivity reflects the high-risk nature of the cruise industry, which is heavily influenced by macroeconomic conditions, global consumer confidence, and discretionary spending. For every 1 percentual point (p.p.) change in the market, RCG's stock moves by approximately 1.95 p.p., underscoring its vulnerability to market volatility since the relation goes both ways.

The coefficients for interest rates, represented by US6M (-0.0134) and Germany Yield (-0.0064), are both negative and statistically significant, with p-values of 0.0255 and 0.0141, respectively. Because these are the yields of debt securities issued by governments like the U.S. and Germany, they represent the risk-free rate of return in the market like the SOFR and EURIBOR and thus, it follows that rising interest rates increase the cost of servicing variable-rate debt, a significant portion of RCG's financial structure, and reduce stock returns as a result. Additionally, higher interest rates may dampen consumer demand for vacations, further contributing to the negative impact (we will study this in further detail, in the interest rate risk section). RCG's interest rate risk management practices which include swap agreements help mitigate this exposure, which can be seen in the small magnitude of both betas, an increase by 1 p.p. in SOFR (or EURIBOR) would lead to a decrease in 0.01 (0.006) p.p. in RCG's stock returns, which is not that materially significant.

For the exchange rate, the statistically insignificant result (p-value = 0.51) is unsurprising and aligns with expectations, likely due to natural hedging. This approach involves balancing revenues

and expenses in the same foreign currency, which reduces exposure to exchange rate volatility. Additionally, as will be detailed in the next section, RCG manages exchange rate risk in conjunction with interest rate risk, further mitigating its potential impact on stock returns.

The insignificance of fuel prices, however, is noteworthy. Considering the critical role of fuel as a major operational cost and its explicit recognition as a risk by RCG, one would expect a stronger relationship. This result likely reflects the effectiveness of RCG's fuel hedging strategy; by hedging fuel price risk, RCG appears to neutralise its impact on stock returns, which reassures investors and stabilises market valuation.

To explore this hypothesis further, we conducted a comparative analysis using Carnival Corporation, a peer company that does not hedge fuel price risk. Replacing RCG's stock returns with Carnival's as the dependent variable, the regression showed that the USO coefficient is statistically significant at a 99% confidence level and has a pronounced negative impact on Carnival's stock returns. This suggests that the absence of fuel hedging exposes Carnival to greater market valuation volatility tied to fuel price fluctuations. Moreover, the magnitude of the negative impact on Carnival's stock returns is larger than that estimated for RCG, reinforcing the importance of hedging in mitigating commodity risk.

In contrast, Carnival's results reveal similar sensitivities to interest rates, but the coefficients are slightly more pronounced. For US6M, Carnival's coefficient is -0.0188, and for Germany Yield, it is -0.0099, both statistically significant. These slightly stronger negative effects may reflect Carnival's higher exposure to variable-rate debt (20% vs 17% of total debt after the swap effect in 2023, for Carnival and RCG, respectively) or less effective hedging practises (Carnival Corporation 2024, 63). As for exchange rate risk, Carnival seems to hedge against it more actively than RCG; at the very least the firm is clearer on what main foreign currencies it is exposed to and how it deals with them, which may explain why its exchange rate proxy has a higher, though statistically

insignificant, coefficient compared to RCG (Carnival Corporation 2024, 62; Royal Caribbean Cruises Ltd. 2024a, 130) (for Carnival's regression see Appendix 5).

The contrasting approaches to exchange rate risk and fuel price risk management between RCG and Carnival align with findings in the existing literature. Mello and Ruckes (2005) suggest that firms in competitive markets make hedging decisions strategically, often influenced by the actions of their competitors. Adam, Dasgupta, and Titman (2007) further propose that firms may forgo hedging if they see strategic advantages in maintaining cash flow flexibility. Carnival's greater sensitivity to fuel prices and exchange rates may reflect a strategic decision to prioritise operational flexibility, while RCG's hedging practises emphasise stability and risk mitigation.

Ultimately, the analysis underscores the importance of robust risk management practises in the cruise industry, where exposure to macroeconomic factors, interest rates, and fuel prices can significantly influence stock returns. RCG's approach to hedging appears to mitigate key risks effectively, while Carnival's strategy leaves it more vulnerable to market volatility, potentially impacting its long-term financial performance and valuation. These differences provide a nuanced understanding of how risk management decisions shape firm-specific outcomes in the same industry.

As for the annual regressions included in appendices 6 to 8, they differ from the daily regressions in several ways. Aside from the data periodicity, these annual regressions do not account for a market control variable, such as MSCI World, which was intentionally omitted to isolate the effects of interest rates, fuel prices, and exchange rates on revenue growth, annual EBITDA margin, and net income growth. Despite the statistical insignificance of many variables in these regressions, the signs of the coefficients remain intuitive. For instance, the negative coefficient for USO in the revenue growth model reflects the expected impact of rising fuel prices on operational costs and profitability. The R-squared values differ across the regressions, with the revenue growth model

having the highest explanatory power ($R^2 = 0.80$), while EBITDA margin and net income growth have lower values (0.27 and 0.51, respectively). This indicates that revenue growth is more directly tied to the variables tested, while profitability is influenced by additional factors not included in the model.

A surprising factor is the negative coefficient for SHY in the revenue growth regression, which suggests that as interest rates fall (reflected by a rise in SHY ETF), RCG's revenue growth decreases, which is counterintuitive. Typically, lower interest rates should stimulate demand, but this negative relationship may indicate that lower rates signal economic weakness, reducing consumer confidence. Additionally, because we did not include a market control variable in the regression, the proxy for interest rates is likely absorbing the market influence effects as well, not just shocks to interest rates. This could explain the unexpected negative impact of lower interest rates on revenue growth.

As for our quarterly regression (Appendix 9), to explain changes in net income we used the true changes in prices for Heavy Fuel Oil (HFO), LIBOR/SOFR as benchmark interest rates, and EUR/USD exchange rates. However, the explanatory power of these variables was low, with an R-squared value of 0.04, and the coefficients were statistically insignificant. This may be attributable to a combination of factors, including the still relatively small sample size (50 observations), potential model specification issues, omitted variables or multicollinearity, or inherent data limitations. Additionally, unaccounted-for seasonality or time-dependent effects in the quarterly data could conceal relationships. In light of these difficulties, we determine that the model is not appropriate for making trustworthy conclusions.

We have concluded the evaluation of results from the market valuation model and will now transition to examining the financial impact model for each risk to assess whether the conclusions drawn here are reflected in the actual financial impacts of RCG's hedging practises.

3.2. Exchange Rate Risk

Exchange rate risk, also known as forex risk, emerges when there is a need to convert currency-denominated values from one currency to the other, thus exposing such values to foreign exchange rates. For a company based in the U.S. like RCG, it implies that as the U.S. dollar appreciates, the effective value collected in other currencies decreases, which is undesirable. Conversely, it reduces expenditures denominated in foreign currencies, which can be beneficial.

RCG's exchange rate risk has four facets: foreign currency-denominated loans, international operations, foreign investments, and the remeasurement of assets and liabilities.

According to RCG's annual reports, its primary source of concern is Euro-denominated loans intended for shipbuilding, for which it uses forward contracts as a hedge against volatility. As of December 2023, RCG had $8 billion in ship orders, with 43.5% exposed to foreign currency risk, which was partially hedged using forward contracts. According to RCG, international business operations don't pose a serious threat in terms of exchange rate risk since, not only overtime, the many currencies in which its transactions are denominated have variations that offset each other, as the income in each currency is used to cover that same currency expenses, thus a natural hedging. We are confident that this strategy works; however, due to a lack of data, we cannot confirm so. The foreign investments of RCG consist of investments in subsidiaries and in operations abroad. To control for this, the RCG strategy passes by denominating part of their debt in the given currencies, reducing their forex risk. Finally, for remeasurements, RCG enters derivative contracts to control the volatility that arises when translating the net values of assets and liabilities from its foreign subsidiaries. These hedging strategies typically involve forward contracts, sometimes backed up by cross-currency swaps and collar options, to manage exchange rate fluctuations.

Due to limitations in available data, we decided not to focus on the exchange rate risk, as conclusions would be heavily, if not solely, influenced by assumptions. However, we believe that

since the main exposure comes from vessel loans, RCG's interest rate hedging strategies naturally align with its exchange rate risk management. After all, the interest rate parity theory states that the difference in interest rates between two countries ($i_d \; and \; i_f$) is equal to the expected change in their exchange rates over time, ensuring that there is no arbitrage opportunity in the foreign exchange markets.

$$F = S \cdot \left(\frac{1 + i_d}{1 + i_f} \right) \tag{1}$$

where F is the forward exchange rate (domestic currency per foreign currency) and S is the spot exchange rate (domestic currency per foreign currency) (Madura and Fox 2007, 266).

In practical terms for RCG, if U.S. interest rates (i_d) rise relative to euro interest rates (i_f), the USD would likely appreciate against the EUR, making euro-denominated debt cheaper when converted to USD. In managing interest rate risks (through swaps), RCG also indirectly manages its exposure to these exchange rate movements.

3.3. Commodity Price Risk

When it comes to global commodity prices and the markets that are used to trade them, there's a significant level of uncertainty tied to the changes in demand and supply that have become harder to predict. Specifically, for energy global supply there's doubts about its security further fuelling price volatility (Pawlowski, Rechtsteiner; Schabram 2024). With the added competition that is predicted to come in the next 6 years in the outlook for the industry, from the increasing number of large players that are expected to become active in trading oil and oil-based products, it is projected a continued growth in total demand for oil until 2030 (McKinsey & Company 2023). In this section we delve into the intricate marine fuel world, its financial derivatives and how RCG uses them to protect itself from fluctuations.

3.3.1. Fuel Price Risk

Cruise boats (and large vessels in general) rely on marine fuel, commonly referred to as bunker fuel. A single vessel can carry simultaneously different fuels for different purposes. In this work, we are analysing the company as a whole and the financial risk strategy is not significantly affected by this, hence we do not enter into more detail on this subject, focusing our attention on the main fuel expense, the one for motors.

Within marine fuel we can subcategorise different types of fuel given their characteristics. The most used one is Heavy Fuel Oil (HFO), a dense, viscous with a high sulphur content and heavy product, which is the leftover of crude refinement. The other subcategories derived from crude are oils that have been more refined, Marine Diesel Oil (MDO), composed of low sulphur, and Marine Gas Oil (MGO), with ultra-low sulphur concentration. Finally, in recent years new types of fuels started being used in maritime industries: Liquified Natural Gas (LNG), filtered natural gas in liquid form (at -163º Celsius), is a less pollutant energy source, and a more compact one, making

it easier to ship and store, thus more efficient; and biofuels, renewable fuels that can be produced using organic sources (U.S. Energy Information Administration, n.d.).

Due to climatic concerns, regulations on sulphur emissions by maritime transportation vehicles have been increasing, which implies a shift away from HFO. This can be done by either changing the type of fuel used or by installing air filters, the so-called scrubbers. RCG is no exception, having chosen to equip its existing cruise boats with scrubbers, allowing to maintain the use of HFO and subsequently low cost per tonne of fuel, thus not requiring an increase in hedging, and buying new ships powered by LNG (Royal Caribbean Group 2022b).

As said above almost all of RCG's fleet uses HFO (only a couple of vessels can be powered either by HFO or LNG), as such it is imperative that we trace out this oil product price and price volatility over time (we will focus and present historical data from 2012 until 2023). While HFO may not be a quoted commodity on stock exchanges, crude oil, the product from which it is derived is in fact quoted and traded in the market (Appendix 10). Comparing the two, HFO annual prices present a high correlation with crude oil annual prices, 0.975, this indicates that HFO price is influenced by the same factors as crude oil price, such as the supply of crude oil (which is controlled by OPEC countries), global economic performance that in part determines the demand for crude oil, speculation in the market or the strengthening of the U.S. dollar (as crude oil is traded in this currency a strengthening of the dollar tends to lead to a decrease in oil prices) (Cliffe 2023).

On its own HFO presents an annual volatility of 29.52%, which can be considered high given that annual volatility in the four years before 2019 was between 10% and 20% (Gerken, Plantefève, and Veillard 2019). To control volatility companies that are affected by it can resort to hedging instruments, as it is the case of RCG and of Norwegian Cruise Line Holdings (Norwegian Cruise Line Holdings Ltd. 2024).

However, some companies prefer not to hedge fuel, as is the case of Carnival Corporation, one of the main competitors in the cruise industry. Carnival has determined that the costs of hedging fuel do not justify the potential benefits. The company believes that, in the long run, the volatility of fuel prices balances out, making the ups and downs less significant in terms of long-term financial impact, focusing its attention on reducing fuel consumption, which has provided substantial savings over time (Kalosh 2023). We believe hedging fuel risk impacts is indeed advantageous as it is important to have consistency and to some extent predictability in costs.

In the past RGC used a mix of fuel call options and fuel swaps; currently, it uses exclusively fuel swaps. A fuel call option consists of a contract that gives the holder the right (but not the obligation) to purchase or sell a specified amount of fuel at a predetermined price on a future date. The option holder evaluates whether to exercise the option conditional on the prevailing market price at that specific moment: should the market price exceed the established predetermined price, the holder can exercise the option by paying the predetermined price; if the market price falls below the predetermined price, the holder does not exercise the option, buying fuel at the prevailing market price instead. Usually, fuel options are traded in commodity exchanges, with the possibility of being cash-settled based on price fluctuations or physically settled with fuel delivery. In simple terms, a company can buy a fuel option to cap the maximum price it will pay for fuel. Some of the cons of using this instrument are the up-front premium payment required, which if the option is not exercised becomes a sunk cost, and the complexity and constant monitoring it needs. On the other hand, it presents advantages such as the flexibility of exercising or not and the opportunity for lower prices than the one agreed upon.

A fuel swap agreement is an over-the-counter (not traded in exchanges) contract where two parties (e.g. a company and a financial institution) establish the trade of cashflows based on fuel price on a given date. Swaps are settled in cash based on the difference between the agreed price and the

market price. In a case like RCG's, where a consumer of fuel wants to hedge its uncertainty regarding future fuel prices, the swap establishes that the company pays the counterparty a fixed price, while the counterparty pays the company the market price. The downsides of this instrument are the limited flexibility, with no choice to leave the deal, and the potential loss if the market price falls below the fixed one. In turn, the pros include the customisation of volume, timeframe and price, the inexistence of up-front costs, and the budgeting and financial planning certainty provided by the fixed price.

Below we present a visual representation of the fuel expenses hedged by RCG.

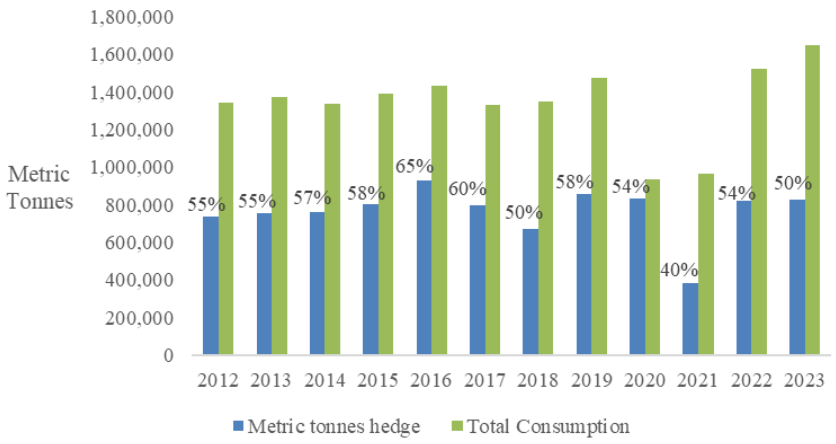

Figure 2 - Fuel Consumed and hedged by RCG

For an effective analysis of RCG's hedging strategy, we isolated fuel expenses from delivery, storage and emission consumable costs, allowing us to focus on pure commodity risk (for a full list of assumption please see appendix 4). The first step was the calculation of fuel expenses net of hedging impacts; provided with that and the financial impact of fuel swaps, we then discovered the fuel expenses with the effect of the current hedging practises (Figure 3 and Appendix 11).

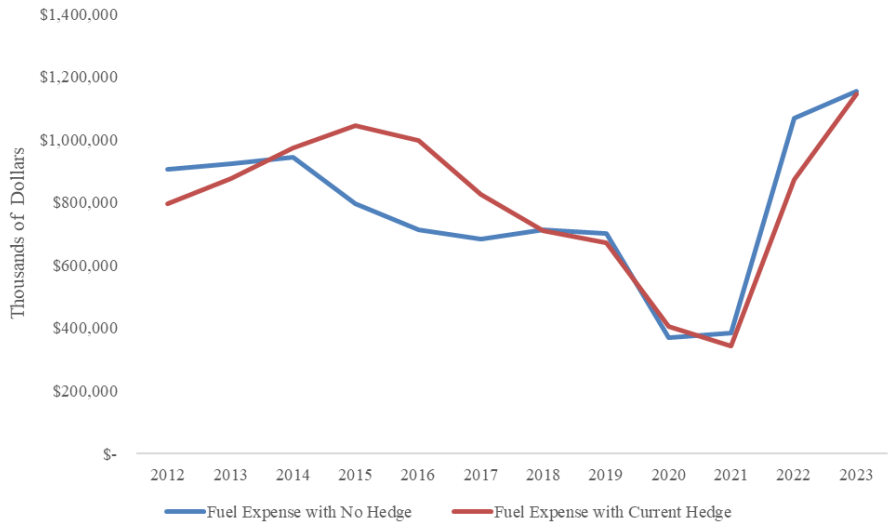

Figure 3 - RCG'S Fuel Expenses

Given that expenses are not only affected by HFO price but also by the quantities brought, for comparison purposes we divided the fuel expenses of each year for the corresponding consumption in metric tonnes, arriving at annual fuel expenses for metric tonnes.

The volatility of annual fuel expenses per metric tonne without any hedge for the entire period under study (12 years) is 25.78%, while the current hedge brings it to 22.48%, a 2.94 p.p. decrease (which denotes an 11.4% improvement), indicating an effective strategy.

With this in mind, our next step was to discover what the terms of the swap agreement were, more specifically the price, information that is not disclosed by RCG. For this purpose, we resorted to the following equation:

$$Swap\ Price = \frac{Average\ Price\ with\ Hedge\ Effect - \left(Price\ without\ Hedge\ Effect * (1 - Hedge\ Percentage)\right)}{Hedge\ Percentage} \quad (2)$$

The results (Appendix 12) show that on a historical basis, in the last 12 years, RCG's agreed swap price averages 105.92% of the market fuel price, as expected given the swap financial impact presented in the financial statements. The worst years, measured as the years in which RCG paid the most above market prices, were without a doubt the period between 2015 and 2017, followed

by 2020. While the latter is more broadly explained by the decrease in fuel prices caused by the pandemic economic slowdown (stop), the earlier one may be surprising for those who did not follow fuel news in the mid-2010s. In fact, that period was marked by a sharp and continued decline in petroleum prices, "one of the three biggest declines since World War II" (Stocker, Baffes, and Vorisek 2024), triggered by production cost drop and weakening demand. These events disrupted market expectations; as such RCG's swap agreements meant to lock in price and decrease volatility, barred it from taking advantage of lower prices, something that would not happen if options were used.

For a better understanding of how much swaps protect RCG's fuel expense, we performed a sensitivity analysis and a worst-case scenario analysis. In the sensitivity analysis, we simulated a 10% rise in market fuel prices, examining its impact on fuel expenses with and without hedge, assuming all else constant. For a 10% increase in fuel expenses without hedge, we simply multiplied the final unhedged fuel price per metric tonne of each year by 1.1. In turn, for fuel expenses with hedge, we assumed that the swap price agreed would not change, thus only the remaining metric tonnes price was changed by the said factor. The following table presents our results:

Fuel Sensitivity Analysis												
In thousands of dollars	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Fuel Expenses without swap	$ 907,187	$ 923,348	$ 944,641	$ 796,711	$ 713,698	$ 684,672	$ 712,039	$ 700,842	$ 371,079	$ 384,532	$1,069,640	$1,153,700
Fuel Expenses without Swap given a 10% increase in fuel price	$ 997,906	$1,015,682	$1,039,105	$ 876,382	$ 785,067	$ 753,139	$ 783,243	$ 770,927	$ 408,187	$ 422,985	$1,176,604	$1,269,070
Real change	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Fuel expenses with Swap	$ 796,192	$ 875,404	$ 875,404	$ 875,404	$ 875,404	$ 875,404	$ 875,404	$ 875,404	$ 875,404	$ 875,404	$ 875,404	$ 875,404
Fuel expenses with Swap given a 10% increase in fuel prices	$ 837,015	$ 916,954	$1,013,245	$1,078,917	$1,023,061	$ 853,748	$ 746,275	$ 700,349	$ 423,556	$ 366,604	$ 923,843	$1,202,385
Real change	5.13%	4.75%	15.75%	23.25%	16.87%	-2.47%	-14.75%	-20.00%	-51.62%	-58.12%	5.53%	37.35%

Figure 4 - Fuel Sensitivity Analysis

As it can be seen the swaps absorb the price change, reducing the percentage change that would indeed occur. In this hypothetical case, in 2012, for instance, without the swap, the fuel expenses would increase by $90,719 thousand (from $907,187 to $997,906). However, with the swap in place, the company would experience a more moderate increase of $40,823 thousand (from $796,192 to $837,015), thus shielding it from 55% of the fuel price increase. This shield, calculated as the percentage increase between the change without swap and with swap, averages 264.72% for the 12-year period. In addition, we remeasured volatility; in this theoretical case the inexistence of swaps leads to a 25.78% volatility; this value dropped to 22.67% when we introduced the swaps; this represents a 12.04% decrease in volatility (higher than the current situation one of 11.4%), showcasing once more swaps effectiveness in protecting RCG from fuel price volatility.

Our worst-case scenario for fuel risk is characterised by an operational income equal to 0, for that we used the Excel solver function to discover for each year what percentage increase in fuel price would be needed to achieve this threshold, holding all else constant.

Fuel Worst-Case Scenario												
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Without Swap	32%	81%	103%	141%	247%	275%	266%	293%	-100%	-100%	-90%	249%
With Swap	99%	192%	232%	261%	591%	637%	532%	708%	-100%	-100%	-100%	499%

Figure 5 - Fuel Worst-Case Scenario

In 2012, the inexistence of hedging would leave the company most exposed to vulnerability, with a 32% increase in fuel prices causing operational income to become 0. The hedge, however, would have protected the firm in this imaginary case, providing a shield of 67 p.p., equivalent to a 209% improvement in resilience. On the other end of the spectrum, 2019, presents as the year the company had the most resilience; for it to have an operational loss without the existence of swaps, it would require a 293% rise in fuel cost, with swaps transforming this value to 708%. Also worth mentioning is the period from 2020 to 2022 marked by operational losses. For 2020 and 2021, even if prices were to drop to 0 the company would continue with operating losses, as for 2022 it would

have been needed for prices to drop by 90% to reach an operating income of 0. Overall, these results illustrate the significant protective effect of swaps, especially during years of intensified financial vulnerability. Although the company has not used any other instruments or strategies in the past 12 years, there are other options that may (or may not) be worth considering.

One of those is forwards. Very similar to swaps, forwards are simple contracts whereby the two parties agree to exchange fuel at a fixed price at a future time point. Unlike swaps, these are always settled physically at a given port. For a company like RCG, these are not ideal given that it is present in over 200 ports, meaning that it would need to effectuate hundreds if not thousands of contracts per year.

Another instrument to consider is futures; this instrument allows its holder to lock in a future fuel price. The main difference from the swap is that it is traded on the stock exchange and, as such, is standardised, which may be seen as a drawback. On the positive side, it is more liquid and transparent. The use of this instrument has been studied in the maritime shipping industry. Čech and Zítek (2022) explore the dynamics of different marine fuels, taking into account prices from diverse ports. The finding found that although low-sulphur fuels have higher hedging potential than high-sulphur ones, the efficiency of futures as hedging tools follows a consistent order: Gasoil futures are the most efficient, followed by Brent with West Texas Intermediate (WTI) alternative, Ultra Low Sulphur Diesel (ULSD) and finally Reformulated Blendstock for Oxygenate Blending (RBOB).

Lastly, we would like to present two option strategies, the collar options and the three-way collar. The first strategy, collar options, is composed of a call option (as the one described before) and a put option (characterized as the inverse of a call, it gives the holder the right to sell at a predetermined price). In this approach, the company buys a call option, limiting the maximum price of fuel (if prices rise above this level, the company exercises the call option, purchasing fuel at the

agreed price), and sells a put option, setting a minimum price (if prices fall below this level, the counterparty exercises the put, forcing the company to buy fuel at the agreed price). If the market price exceeds the call option strike price, there is a hedging gain; if the price falls below the put option strike price, there is a hedging loss. If the price remains between the two strike prices, there is neither a hedging gain nor a loss. This creates a price range (or band) within which prices can fluctuate, introducing some volatility to the hedging strategy (Lee, 2024). For RCG this would mean a relative trade between minimising volatility and expanding potential cashflows. With resource to the Black-Scholes model, we have determined the potential cost of this approach, for a collar option with USO as the underlying asset. The input data, as of December 12, 2024, includes an annual USO volatility of 33.13%, a risk-free rate of 4.22% (based on the 1-Year U.S. Treasury Bill), a current USO price of $466 per metric tonne, and a one-year maturity. As for the strike prices, we used $465 per metric tonne as floor and $497 per metric tonne as cap (taking into consideration the expected price of HFO for 2025 of $494), arriving at a cost of $3428 thousand per 500 000 metric tonnes (around 1/3 of the expected consumption) (Appendix 13). In percentage terms, this value corresponds to 0.3% of the 2023 fuel expenses, denoting the relative cost-effectiveness.

The second and final strategy is the three-way collar an extension to the regular collar, where the consumer in addition to the collar option purchases an out-of-the-money put option (with a price lower than the previous one). This creates an extra safety net, reducing hedging losses in extreme price drops (Mercatus Energy 2018).

Although so far we only looked into fuel derived from crude, as stated before RCG is purchasing new vessels powered by LNG. With this in mind, we explored this new font of uncertainty RCG is starting to face.

Liquified natural gas prices have been very volatile, exhibiting high volatility in months where other commodities' volatility was low in late 2023 (Kleinschmidt 2024). To check on just how much LNG prices are volatile we have determined the annual volatility of this product. The annualised volatility for the last 10 years (January 2014 and September 2024) was 69,54%; if instead, we investigate the time period from January 2021 to September 2024, we discover an even more alarming figure, 89,19%. Not only that but future prices are also concerning with LNG futures for 2025 raising unease. This reinforces just how important hedging LNG prices will become for RCG, especially as the fleet driven by LNG increases.

3.3.2. Recommendations

Our study showed that RCG's hedging strategy effectively conveys its purpose of defending against market price volatility, fulfilling cost predictability and maintaining financial stability. However, the current strategy may be overly conservative; the years between 2015 and 2017 show that the fixing price strategy is too strict, preventing RCG from benefiting from favourable market conditions during fuel bear markets. To optimise RCG's hedging practises, we recommend exploring alternative instruments, in particular options, that preserve the downside advantages. From these, collar options stand out, allowing to control volatility while maximizing the benefits.

Looking ahead, RCG is a pivotal moment in time, with a new fuel, LNG, entering the game. It is essential to figure out the new dynamics, hedge instruments and their effectiveness as soon as possible, while expenses are modest. This would provide a solid foundation to later scale the findings as needed. Combining lessons of the past with a forward-looking approach, like the one presented, will ensure RCG remains resilient in an ever-evolving sector.

4. General Recommendations

To ensure a company's hedging strategy is truly effective, it is essential to evaluate its net economic exposure rather than focusing on isolated risks. Net economic exposure reflects the combined risks faced by an enterprise, encompassing both direct and indirect exposures. This perspective is particularly critical in large, multi-business organisations like RCG, where siloed approaches to risk management can lead to inefficiencies or even contradictory strategies. For instance, different business units may hedge opposite sides of the same risk, negating the benefits of their individual efforts. Adopting an integrated approach allows the organisation to identify its true risk profile and streamline its hedging activities accordingly (Fisher and Kumar 2010).

In the case of RCG, we assessed whether the company's strategies for managing commodity price risk and interest rate risk were inadvertently working against one another. Our analysis revealed a weak positive correlation of 0.06 between these variables, indicating minimal interdependence at present. This suggests that RCG's risk management strategies are not counterproductive but reinforce the importance of regular evaluations to maintain alignment across the company.

Moving forward, RCG should adopt a holistic framework for financial risk management that considers aggregated exposure across all risk categories. This includes fostering cross-functional communication between departments and leveraging enterprise-level data to gain a comprehensive view of risk interactions. By doing so, RCG can avoid redundancy, reduce costs, and ensure that all risk management efforts contribute to the company's broader strategic goals.

Additionally, RCG should implement tools and processes to continuously monitor and analyse the interplay of its financial risks. Scenario analysis, stress testing, and regular updates to risk models should be integral to this process, ensuring that strategies remain aligned with evolving market conditions, by taking this proactive, integrated approach, RCG can optimise its hedging practises,

better manage its economic exposure, and strengthen its financial resilience in a rapidly changing environment.

5. Conclusion

The purpose of this thesis was to analyse and evaluate RCG's financial risk management strategies. Our work, based on the investigation of financial disclosures related to financial risk made by the firm, allowed us to verify the effectiveness of its strategies. While the current approach provides a good hedge against commodity price and interest rate risk there is room for improvement. The existing tactic provides an excellent result on the downsides of the risk; however, they are somewhat restrictive, blocking the company from reaching benefits on the upsides.

Our recommendations pass through the analysis of swap alternative hedging instruments available in the market and adjustments to the current instruments being used. For fuel price risk, collar options seem to be the most trustworthy choice, while for interest rate risk, an adaptation of the benchmark interest rate used in the current swap agreements could prove a step towards aligning EUR-denominated debt with macroeconomic trends.

The cruise industry remains a fascinating yet underexplored field, particularly when it comes to financial risk management. This thesis offers a fresh perspective, presenting innovative research that can serve as a blueprint for other companies within the sector to refine their own approaches. Beyond the cruise industry, the insights gained here have broader implications. The techniques and strategies employed by an industry leader like RCG could resonate with other sectors facing similar financial challenges, such as maritime shipping or aviation. These industries share parallels in capital intensity, exposure to market volatility, and the need for robust risk management frameworks.

With the right financial risk management, companies can confidently navigate the turbulent waters of an ever-changing world.

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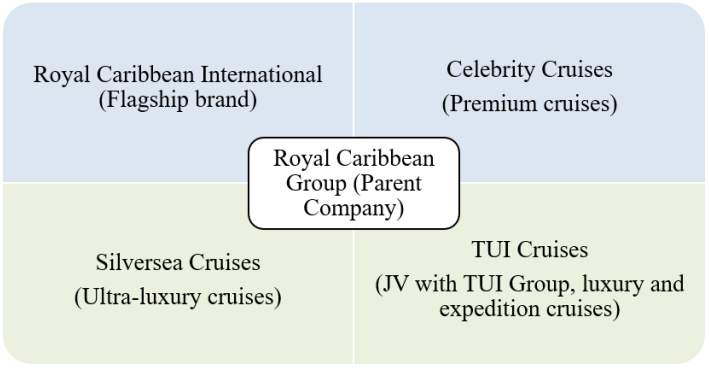
7. Appendix



Appendix 1 - RCG's structure

Semi Annual									
Start Date	21-10-2024	31-12-2024	30-06-2025	31-12-2025	30-06-2026	31-12-2026	30-06-2027	31-12-2027	30-06-2028
End Date	31-12-2024	30-06-2025	31-12-2025	30-06-2026	31-12-2026	30-06-2027	31-12-2027	30-06-2028	31-12-2028
Rates	4.68%	4.12%	3.54%	3.34%	3.39%	3.35%	3.32%	3.38%	3.42%
Semi Annual									
Start Date	31-12-2028	30-06-2029	31-12-2029	30-06-2030	31-12-2030	30-06-2031	31-12-2031	30-06-2032	31-12-2032
End Date	30-06-2029	31-12-2029	30-06-2030	31-12-2030	30-06-2031	31-12-2031	30-06-2032	31-12-2032	30-06-2033
Rates	3.44%	3.49%	3.54%	3.57%	3.60%	3.63%	3.67%	3.71%	3.74%

Appendix 2 - SOFR Forward Rates

EURIBOR										
Date	05/12/2024	05/06/2025	05/12/2025	05/06/2026	07/12/2026	07/06/2027	06/12/2027	05/06/2028	05/12/2028	05/06/2029
6- Month	2.80%	2.22%	2.13%	2.15%	2.23%	2.28%	2.29%	2.31%	2.33%	2.35%

Appendix 3 - EURIBOR Forward Rates

General	We used historical growth rates from 2013 to 2023
	Assume that projections of forward rates (SOFR, EURIBOR) and fuel prices will hold for modelling hedging impacts
	Assume the cruise industry will continue its recovery post-COVID-19, with increasing demand and revenue growth aligned with global projections
	In regressions dates without data for one of the variables were not used (data cleaning)
Commodity	The actual quantity of fuel used is the one predicted on the previous year 10-k
	Given we did not had data we assume all fuel is HFO
	All fuel swap agreements within the same year have the same swap price
	Related costs such as delivery, storage and emisson costs are not hedged
	In sensitivity analysis and worst-case scenario with swaps, swap price and percentages hedged do not change
Interest Rate	Given that we do not know the exact date for each swap agreement, we used the closest rate for the end of the given month (except for Odyssey of the Seas where we had access to its credit agreement)
	Assume no significant changes to RCG's debt structure outside what is analysed (e.g., principal repayment schedules and interest rate hedging)
	Zero-floor rates for the Harmony of the Seas and Odyssey of the Seas loans and respective swaps (for all the analyses performed)
	To build the loan payment structure we used the equal payment method for principal repayment
	For Odyssey of the Seas we assume swap dates were renegociated to match the deferral of the term loan
	Since only swap rates are disclosed by RCG we assume that loan rates match these
	Assume that within one year the % of remaining principal covered by the swap does not change
	For prediction we calculated % covered by swaps with the historical growth rate of the % covered in that swap
	In sensitivity and worst-case scenarios the increases/decreases in rates are equal within the same year
	In sensitivity and worst-case scenarios the effect on remaining debt and tax shield effect are not taken into account

Appendix 4 - Assumptions Table

Regression Statistics	
Multiple R	0.56250893
R Square	0.316416297
Adjusted R Square	0.315040323
Standard Error	0.028770808
Observations	2490

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0.000178965	0.000577974	-0.309641511	0.75685956	-0.001312325	0.000954396
USO	-0.072658208	0.024452579	-2.971392389	0.00299298	-0.120607746	-0.024708669
UUP	0.051033851	0.122987512	0.414951483	0.67821326	-0.190134756	0.292202457
MSCI World	2.089406561	0.064881095	32.20362679	1.893E-190	1.962179959	2.216633162
US6M	-0.018797467	0.006459328	-2.910127337	0.00364495	-0.031463688	-0.006131245
Germany Yield	-0.009954673	0.002806578	-3.546907649	0.000397	-0.015458146	-0.0044512

Appendix 5 - Carnival's market valuation model

Regression Statistics	
Multiple R	0.895649315
R Square	0.802187696
Adjusted R Square	0.683500314
Standard Error	0.923992878
Observations	9

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.251322831	0.316966516	0.7929	0.463781	-0.5634655	1.0661112
USO	-0.411347887	0.915572222	-0.44928	0.672035	-2.7649012	1.94220543
SHY	-75.86795126	18.61547449	-4.075531	0.009582	-123.72055	-28.015351
FXE	0.633346756	4.498911373	0.140778	0.893541	-10.931473	12.1981666

Appendix 6 - Revenue Growth regression

Regression Statistics	
Multiple R	0.52104381
R Square	0.27148666
Adjusted R Square	-0.1656214
Standard Error	2.34410599
Observations	9

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0.4161338	0.804122116	-0.5175	0.626879	-2.4831955	1.6509279
USO	2.74896754	2.322743365	1.1835	0.289808	-3.2218344	8.7197694
SHY	17.3668702	47.2261705	0.367738	0.728122	-104.03187	138.76561
FXE	-4.5427751	11.41342681	-0.39802	0.707041	-33.881923	24.796373

Appendix 7 - EBITDA margin regression

Regression Statistics	
Multiple R	0.713951348
R Square	0.509726528
Adjusted R Square	0.215562444
Standard Error	0.164049079
Observations	9

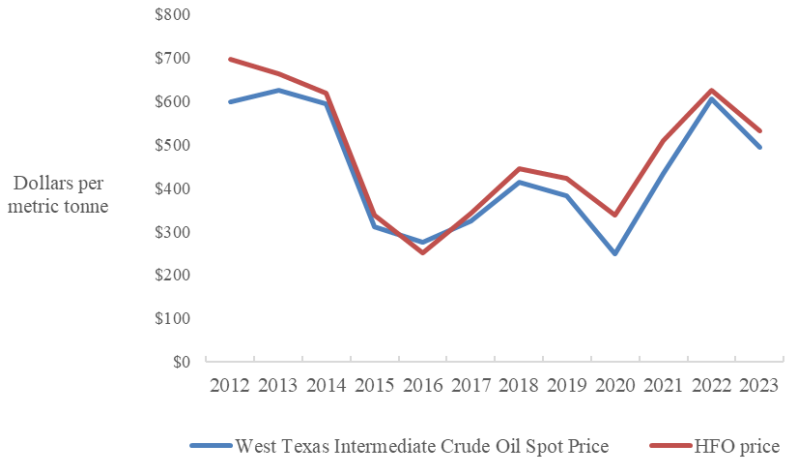
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2.251605457	0.056275396	40.010477	1.83879E-07	2.10694495	2.39626597
USO	0.224533445	0.162554045	1.3812849	0.22573162	-0.193325	0.64239192
SHY	-1.695114176	3.305059509	-0.512885	0.629879935	-10.19104	6.80081176
FXE	-0.527912204	0.7987532	-0.66092	0.537895497	-2.5811727	1.52534826

Appendix 8 - Net Income regression

Regression Statistics	
Multiple R	0.204060885
R Square	0.041640845
Adjusted R Square	-0.02086084
Standard Error	0.373870155
Observations	50

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	3.031392813	0.054322127	55.804016	6.6313E-44	2.92204804	3.14073758
HFO	0.182893944	0.370597461	0.4935111	0.62399963	-0.5630801	0.92886794
Interest Rate	-0.07904388	0.095025174	-0.83182	0.40980782	-0.2703196	0.11223188
Exchage Rate	-1.74298309	1.386311818	-1.257281	0.21499813	-4.533484	1.04751787

Appendix 9 - Quarterly regression



Appendix 10 - Crude Oil and HFO price comparison

Fuel expenses and Current Hedging Impact												
In thousands of dollars	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Fuel Expense with no hedge	$ 907,187	$923,348	$944,641	$ 796,711	$ 713,698	$ 684,672	$712,039	$ 700,842	$ 371,079	$384,532	$1,069,640	$ 1,153,700
Current Hedging Impact	$ 110,995	$ 47,944	$ (27,984)	$ (248,744)	$ (284,384)	$(141,689)	$ 1,366	$ 29,929	$ (35,407)	$ 41,000	$ 195,000	$ 9,000
Fuel expense with current hedge	$ 796,192	$875,404	$972,625	$1,045,455	$ 998,082	$ 826,361	$710,673	$ 670,913	$ 406,486	$343,532	$ 874,640	$ 1,144,700

Appendix 11 - Fuel Expenses and Hedging Impact

Fuel price and Swap Terms												
In dollars per metric ton	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Fuel Price with no Hedge	$ 676.09	$672.64	$706.62	$573.32	$498.82	$514.10	$528.45	$474.43	$395.62	$399.46	$702.81	$698.66
Fuel Price with Current Hedge	$ 593.37	$637.71	$727.55	$752.31	$697.58	$620.50	$527.44	$454.17	$433.37	$356.87	$574.69	$693.21
Fuel Swap Price	$ 525.69	$609.14	$743.35	$881.93	$804.61	$691.42	$526.43	$439.50	$465.53	$292.98	$465.54	$687.76
Fuel Swap Price as % of Fuel Price with no Hedge	77.75%	90.56%	105.20%	153.83%	161.30%	134.49%	99.62%	92.64%	117.67%	73.34%	66.24%	98.44%

Appendix 12 - Fuel Swap Price

Black-Scholes - Put option fuel		
Time to maturity (years)		1,0
Strike price (floor)	$	464,97
Current price (USO)	$	466,31
Annual Volatilty of USO		0,3313
Option Notional (metric tonne)		500.000
Risk free rate (U.S. 1Y Tresury Bill)		0,0422
d1		0,0469
d2		-0,2844
N(d1)		0,5187
N(d2)		0,3881
Put Price (per metric tonne)	$	48,348
Total cost with Put Options	**$**	**24.174.160**

Black-Scholes - Call option fuel		
Time to maturity (years)		1,0
Strike price (cap)	$	496,82
Current price (USO)	$	466,31
Annual Volatilty of USO		0,3313
Option Notional (metric tonne)		500.000
Risk free rate (U.S. 1Y Tresury Bill)		0,0422
d1		-0,1530
d2		-0,4843
N(d1)		0,4392
N(d2)		0,3141
Call Price (per metric tonne)	$	55,206
Total cost with Call Options	**$**	**27.602.980**

Appendix 13 - Fuel Option Price