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Fundamental Valuation of NOV

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Master thesis, MSc Economics and Business Administration, Finance

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

The purpose of this thesis is to conduct a fundamental valuation of NOV to provide an equity value and share price as of 17 January 2023. To support the fundamental valuation of the company, I have also performed a relative valuation, using the EV/EBITDA and P/S multiples. I conduct a comprehensive examination of macroeconomic, industry-, and company-specific factors that drive value in the oilfield services and equipment industry. These analyses are utilized to make necessary assumptions, forecast NOV's future performance, and ultimately estimate the company's equity value and final price target.

Acknowledging the accelerating global energy transition and growing public concern about climate change, companies that offer equipment and technologies supportive of cleaner energy sources have experienced considerable demand growth in recent years. Driven by regulatory changes, subsidies, volatile oil and gas prices, and the ongoing shift towards sustainable energy sources, the industry is continuously nudged to adapt and innovate. With its long history as a market leader in the global oilfield services and equipment industry, an extensive product portfolio, and a global customer base comprising several large upstream oil and gas companies, NOV is solidly positioned within the global energy markets. Amid a moderately competitive situation, NOV is poised to continue to grow the upcoming years, particularly as it ventures into the booming renewable energy market.

Considering these factors, the fundamental valuation yields an estimated share price of $11,6 for NOV. Supported by a relative valuation using the EV/EBITDA multiple, this analysis suggests a potential downside relative to the current stock price. The final estimated price target of NOV's stock is adjusted to $12,5, derived from a weighted average of the estimations from both fundamental and relative valuation methods, allocated with a 70/30 weight, respectively. While the estimates are characterized by a high degree of uncertainty, as investigated through a sensitivity analysis, the conclusion suggests a potential overvaluation of NOV. Hence, as of January 17, 2023, I would propose a sell recommendation.

Keywords: Financial economics, Fundamental valuation, Discounted cash flow analysis, Relative valuation, Oilfield services and equipment, Oil, gas, and energy

Preface

The fundamental valuation presented in this thesis was conducted as a part of the Master of Science in Economics and Business Administration at the Norwegian School of Economics (NHH), under the supervision of Professor Øystein Gjerde. I am deeply grateful for his encouragement, guidance, and insightful feedback.

With a major in Financial Economics, the thesis incorporates theories and concepts gained from a variety of courses completed at NHH. In addition, the thesis is based on NOV's annual reports, as well as several papers, books, and other publicly available data sources. I acknowledge the support and contributions of these various data sources, but I will point out that the contributions to this thesis are independent.

After my Summer Internship in the company, I was eager to apply my experiences there and integrate them with my studies at NHH. The oilfield services and equipment industry is incredibly intriguing due to its complexity and recent exciting and challenging events. This led me to conduct a fundamental valuation of the company. The aim of this work was to examine the pricing of NOV and investigate whether the market is currently overvaluing NOV's fundamentals. I used a research methodology based on a fundamental valuation complemented by a relative valuation, through which I identified a potential overvaluation of NOV. Though completing this thesis was challenging, the journey offered invaluable insights and rewarding outcomes.

Finally, I would like to thank my mother for being helpful and supportive during my time studying economics and business administration at NHH.

Bergen, 28 May 2023

Tor Øyel Kaldestad

Contents

Table of Contents

1. Introduction

The ongoing transformation in the oil and gas industry towards alternative energy sources and net-zero emissions by 2050 is challenged by a persisting negative image. This is mainly due to a slow shift towards renewable energy sources and continuing high levels of pollution. However, awareness and investments towards sustainability have increased since the Paris Agreement (IMF, 2022). The global economy has faced pressures from high inflation and interest rates, largely influenced by pandemic-related stimulus packages and the Russia-Ukraine war. Consequently, countries with significant oil and gas sector contributions to GDP, such as Norway, witnessed increased oil and gas activity, highlighting the sector's resilience (DNV, 2023). Demand for oil and gas, driven by economic development in both emerging and developed markets, directly impacts the oilfield services and equipment (OFSE) industry and companies such as National Oilwell Varco (NOV) (IMF, 2022).

In the midst of geopolitical tensions, socio-cultural pressure for sustainability and climate action is substantially influencing the oil and gas industry. Technological advancements, including artificial intelligence and drilling automation, offer opportunities for improving efficiency, decision-making, and safety, as well as help companies gain or maintain a competitive edge. The industry is experiencing an energy transition towards cleaner energy sources, and thus requires diversification into sustainable technologies and practices (DNV, 2023). Hence, companies like NOV need to differentiate itself amidst this competitive situation, while addressing factors such as commodity fluctuations, the economic outlook, and geopolitical risks, to facilitate further growth and innovation.

This thesis aims to investigate the drivers and characteristics of the OFSE industry in order to estimate NOV's intrinsic value based on a fundamental valuation, which will be supported by a relative valuation. A thorough analysis will be conducted, examining macroeconomic, industry-, and company-specific factors that drive value in the OFSE industry.

The thesis is structured as follows. Section 2 presents a detailed presentation of NOV and its industry, as well as the global oil, gas, and energy markets. In Section 3, various valuation methodologies are outlined, and the most suitable approach for NOV is examined. Sections 4, 5, and 6 offer an in-depth analysis of macroeconomic, industry and company analysis respectively. Section 7 investigates NOV's historical accounting figures and provides estimates for the year 2022. Section 8 estimates the appropriate company cost of capital and

discount. Moving on to Section 9, estimates for the forecasting period are provided. Section 10 reviews the results derived from both fundamental and relative valuations along with a corresponding sensitivity analysis, while the final segment, Section 11, concludes the thesis.

2. NOV and Oil, Gas and Energy Markets

This section introduces National Oilwell Varco (NOV) and the oilfield services and equipment (OFSE) industry, which the company operate in. The section provides a better understanding of both NOV and their competitors, as well as the industry that they operate in and the global energy markets.

2.1 NOV

NOV is multinational corporation publicly traded on the New York Stock Exchange (NYSE) under the ticker symbol "NOV". As of January 17, NOV's current market capitalization is $9,240 billion (Yahoo). The company designs, constructs, manufactures, and sells products, components, and systems for oil and gas drilling and production, as well as industrial and renewable energy sectors worldwide. The company has over 150 years of history in the global energy industry and NOV's history dates back to 1862 when Oilwell Supply, one of NOV's two main predecessors, was founded in Houston, Texas. However, it was not until 2005 that the company merged to become what it is today. NOV is one of the world's leading innovators in their field and conducts operations in excess of 500 locations in 61 countries across six continents, as figure 1 illustrates.

Figure 1: Map that illustrates where NOV conducts operations.
Source: (NOV, 2023)

As figure 2 shows, the NOV's United States operations stands for the largest share of the company's total revenues, followed by Norway, Saudi Arabia, Brazil, and China. The total revenues of the fiscal year 2021, was $5,524 million, where the revenues from United States, Norway, Saudi Arabia, Brazil, and China account for $365, $316, $316, and $222 million respectively.

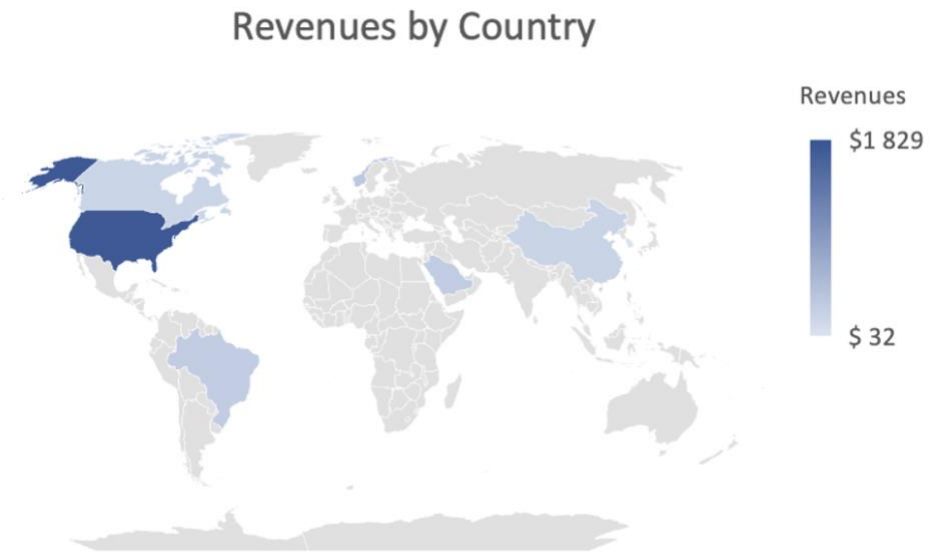

Figure 2: This map illustrates NOV's revenues by country based on sales destination of the products or services. The mapped countries include the United States, Norway, Saudi Arabia, Brazil, China, Canada, United Kingdom, Singapore, United Arab Emirates, and South Korea. Revenues from other countries total $1,829 million.
Source: Author's own analysis based on numbers from NOV Annual Report 2021.

2.1.1 Segments

NOV operates in several continents, including North America, South America, Europe, Africa, Asia, and Australia. The company has a significant market share in the global OFSE industry and is considered a leading provider of drilling and wellbore equipment. NOV operates in the following three main segments: Completion & Production Solutions, Rig Systems, and Wellbore Technologies. As figure 3 illustrates, the Completion & Production Solutions is the largest segment measured by revenue. In this section, these segments will be elaborated on further.

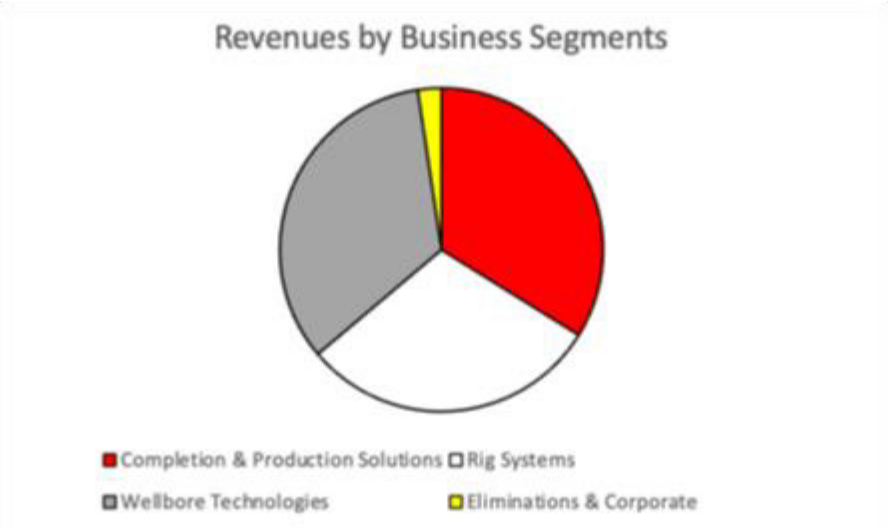

Figure 3: Revenues by NOV's business segments. Note that Eliminations & Corporate costs is intercompany transactions conducted between the three segments.
Source: Author's own analysis based on numbers from NOV Annual Report 2021.

Completion & Production Solutions

The Completion & Production Solutions segment is a key part of NOV's business, and it provides a wide range of products and services that are essential to the completion and production of oil and gas wells. The segment serves an extensive range of customers, including major oil and gas companies, independent exploration and production companies, and national oil companies. The completion & Production Solutions segment of NOV's operations, provides innovative solutions to maximize the flow of hydrocarbons and direct discrete production streams. This segment offers a comprehensive range of equipment and technology for the upstream oil and gas industry, from drilling and completion to production and post-production. When the drill bit stops turning, their equipment allow operators to optimize the completion of a well. Once a well is completed, the production begins and whether on land or offshore, NOV delivers technology and equipment to help lift, pump, flow and separate oil and gas, water, and sand streams on the surface or subsea.

NOV's Completion & Production Solutions segment provides a wide range of products and technologies that can be grouped into the following categories:

- Completion Tools

- Intervention and Stimulation Equipment
- Process and Flow Technologies
- Subsea Production Systems

Completion Tools

NOV's Completion Tools unit provides their oil and gas customers completion equipment that improve reservoir performance and production, as well as improving efficiency and reducing capital expenditure. NOV's Completion Tools solutions offer a wide range of completion tools from well construction to completions, including multistage fracturing, well construction completions, conventional completions, advanced completions, and intervention tools. The purpose of these completions and tools varies depending on their specific use. Some are designed to perform ball-activated completions in open or cemented installations or to function sliding sleeves with coiled tubing. Their usage aims to improve well integrity and reduce downtime. Others provide sub-surface safety valves, production packers, and flow control products, fulfilling conventional completion needs. Some tools can be activated without the need for expensive control lines, wireline, or coiled tubing intervention, making them ideal for offshore and complex long horizontal wells. Lastly, Completion Tools offer coiled tubing and wireline completions that can be customized to specific well requirements. By having a diverse range of tools and completions, this business unit ensure that they can meet the various needs of their clients efficiently and effectively. In addition to provide their oil and gas customers equipment, NOV's Completion Tools solutions provide field service and technical support throughout the project's lifetime (NOV, 2023).

Intervention and Stimulation Equipment

The Intervention and Stimulation Equipment unit designs and manufactures capital equipment and related consumables for oilfield pressure pumpers and coiled tubing and wireline for service companies. This unit delivers complete solutions that maximize efficiency, improve service value, increase bottom line, and apply extensive research, testing, engineering, and manufacturing to deliver the customized equipment packages of their customers' needs.

The pressure pumping solutions supply well service pumps, fluid ends and expendables, centrifugal pumps and spares, high pressure flow iron, missile trailers, zipper manifolds and frac trees. In addition, this unit offers repair and recertification services for the company's and their competitor's products.

The coiled tubing solutions design and manufacture a wide range of coiled tubing units for land-based and offshore operations. These units are manufactured specifically for their customers' needs and to meet the demanding oilfields restrictions around the world. Currently, there are 1.300 coiled tubing units in use worldwide from the Tropics to the Arctic. As well as providing coiled tubing units, NOV' coiled tubing solutions provide coiled tubing drilling equipment. The company´s coiled tubing drilling solutions consist of tailor-made turnkey drilling systems, as well as conventional coiled tubing. Furthermore, NOV provides a variety of equipment used for coiled tubing pressure control both on surface and subsea, as well as providing all the equipment needed from the wellhead to the injector head.

Wireline tools are used when well intervention related activities need to be performed in oil and gas wells that are already producing. Wireline is often used instead of coiled tubing because rig in and rig out times are shorter for wireline units, and the run-in hole and out-of-hole speeds are quicker for wireline. In addition, since wireline is usually cheaper than coiled tubing because less equipment and workers are required for the job, it takes less space on site. However, wireline needs to be tracked to avoid failure during operation because of fatigue and corrosion.

NOV's wireline tools are designed such that they could be efficiently lowered down into the wellbore. The company provides different types of wirelines, including slickline, braided line and conductor. The different characteristics for these types of wireline are that they consist of a non-electrical metal cable used on sites that do not require a lot of tensile force, multiple strands of wire used for fishing and plug retrieval, and an electric cable inside the wireline to send and receive signals from the downhole tools used for running different logging tools, respectively (Oil and Gas Overview, 2020). In addition, NOV supplies their oil and gas customers with wireline equipment and tool string components. The different types of wireline equipment, including wireline units, cranes, powerpacks, and blowout preventers, are used for providing pulling power to deploy the wireline in the hole, lifting wireline equipment, providing power for the operation, and pressure control to prevent blowouts, respectively (NOV, 2023).

Process and Flow Technologies

NOV's Process and Flow Technologies unit supplies customers in the oil and gas industry, as well as the industrial market, with integrated processing, production, and pumping equipment. These solutions increase the efficiency of the wells, and thus increasing the projects' life-cycle

economics. The Process and Flow Technologies unit consists of three sub-units; Production and Midstream, Wellstream Processing, and Industrial.

The Production and Midstream sub-unit manufactures a wide range of pumping technologies, including reciprocating, multistage, and progressive cavity pumps, as well as artificial lift systems. This unit provides proven solutions spanning every facet of the midstream industry, from processing to transportation, with customized equipment and packages.

The Wellstream Processing sub-unit delivers innovative and cost-efficient technologies and solutions that are customized to meet specific challenges and on-site conditions to the upstream oil and gas industry for the separation and treatment of oil, gas, produced water, solids, and seawater. This sub-unit provides their customers carbon capture utilization and storage solutions for many industry applications. NOV has more than three decades of global process engineering and gas treatment experience, including offshore offloading, geological storage, and transport.

The Industrial sub-unit manufactures heat exchangers, as well as pumping, mixing, and agitation equipment for industrial end-markets, including mineral processing, chemical, environmental, and general industry. These products are designed for general use (NOV, 2023).

Subsea Production Systems

NOV´s Subsea Production Systems offers a broad range of comprehensive floating production systems, including topside process modules and turret mooring that minimize execution risk and maximize operability and crew safety. The company provides complete technology, engineering, carbon reduction, and project management to supply topside solutions for floating, production, storage, and offloading (FPSO) projects. This unit partners with operators from concept to deployment, as well as being the equipment provider to both end customers and engineering, procurement, and construction, so called “EPC” firms. These technical innovations improve subsea infrastructure and reduce costs and are designed to operate worldwide in rough offshore conditions. Hence, NOV manufactures flexible pipes, which consist of several unbonded steel and composite layers that are helically wound; these are complex structures that can withstand the rigorous pressures and tensile loads associated with deepwater production, all while being resistant to fatigue caused by waves and tides. In addition to its primary segments, Subsea Production Systems offers support for offshore wind

projects and the electrification of offshore infrastructure by providing dynamic power cable accessories.

Rig Technologies

Rig Technologies provides a wide range of solutions that are essential for oil and gas wells. This business unit as a global leader in the engineering and manufacturing of advanced drilling equipment, and related capital equipment for oil and gas wells. As part of their sustainable approach, Rig Technologies supports renewable energy equipment and technology with a focus on solar and wind solutions.

NOV's Rig Technologies business segment provides a comprehensive range of innovative products and technologies that can be grouped into the following categories:

- Rig Equipment
- Marine and Construction
- Aftermarket Operations

Rig Equipment

NOV engineers and manufactures drilling land rigs and advanced drilling equipment packages, such as pipe handling and power and control systems, to drill oil and gas wells. Their products are specifically engineered to automate complex drilling rig processes, such as automation control systems and robotics solutions. The portfolio of solutions also includes innovations and technologies within rig operations, such as top drive drilling systems and automated roughneck. As the global energy market has shifted towards more sustainable solutions, NOV's Rig Equipment unit has developed innovative technologies that reduce energy consumption and environmental impact by enabling energy regeneration. To maximize rig fleet drilling uptime, reduce costs, and provide customer training, this business unit also provides a wide range of aftermarket solutions and services, including repairs, spare parts, upgrades, and rentals, as well as technical support and monitoring.

Marine and Construction

The Marine and Construction sub-unit serves their customers within multiple markets, such as the oil and gas industry, wind energy, and other marine-based end markets. Their solutions consist of technologies and services that optimize performance, extend their customers' asset field life, and enables successful project developments. NOV has gained leading experience

and specialist knowledge in the industry, by applying engineering consultancy, manufacturing expertise, integrated systems, innovative technologies, and aftermarket support.

This business unit is responsible for the design, engineering, and manufacturing of a wide range of heavy-duty equipment, such as heavy-lift cranes, a diverse range of knuckle-boom and lattice-boom cranes that include active heave options, deck-handling machinery, and mooring and anchor machinery. This sub-unit also provides solutions for offshore wind turbines, including pipelay and construction vessel systems, as well as innovative technologies and equipment for drilling rigs and wind turbine installation jack-ups. In addition, NOV's Marine and Construction business unit provides their customers floating offshore wind solutions and design solutions for drilling jack-ups and floaters.

Aftermarket Operations

NOV's equipment and technologies are designed to help customers maintain and improve the performance of their oil and gas wells and to extend the life of the well. However, to maximize their customer's performance and uptime, NOV's equipment and technologies are supported by aftermarket products and service solutions. The aftermarket operations include technical support, field service, repair services, spare parts, training, and field engineering.

Wellbore Technologies

NOV Wellbore Technologies provides a wide range of technologies, equipment, and services that are crucial for their customer's oil and gas wells and drilling efficiencies and economics. Their innovative wellbore solutions enhance drilling performance and facilitates efficient data transmission. These solutions include drill bits, directional drilling tools, borehole services, as well as optimization and automation software and services. In addition, NOV provides downhole tools for drilling and intervention, premium drill pipe and drill stem accessories drilling and completion fluids, solids control and waste management equipment and services, data acquisition and analytics technologies, managed-pressure-drilling systems, coating and inspection services, and RFID technology for drill pipe lifecycle management.

NOV's Wellbore Technologies business segment provides a comprehensive range of innovative products and technologies that can be grouped into the following categories:

- Downhole
- Tuboscope

- Directional Drilling
- Wellsite Services

Downhole

NOV's Downhole business unit provides their customers with drilling and intervention equipment on a worldwide basis. NOV is the world´s largest independent supplier in this segment. The business unit has established engineering teams, manufacturing facilities, supply hubs, and service centers located in oil and gas activity regions. Hence, they can actively provide support and tools to the drilling and intervention operations where their customers need them. Their solutions increase drill rate and uptime, as well as improve safety on their customers' drilling and intervention operations. NOV offers a constantly evolving product portfolio that includes downhole drilling motors, agitator systems, and fishing and tubing tools. Their product portfolio significantly increases the efficiency of drilling, workover, and intervention operations, enabling faster project completion and better workflows.

Tuboscope

NOV Tuboscope, a global leader in tubular and inspection, provides services for oil country tubular goods (OCTG), including drill-pipe, casing, production tubing, and line pipe. With a track record spanning 80 years, Tuboscope offers a comprehensive inspection, coating, and repair process that promote confidence in crucial OCTG customers. In addition, this business unit offers solutions for artificial lift rods, line-pipe connection systems, pipe thread protection systems, as well as RFID technology to manage the entire drill-pipe lifecycle.

Directional Drilling

NOV provides a wide range of reliable cost-effective directional drilling tools, technologies, and packages to the industry. The Directional Drilling business unit is a leading independent supplier of directional drilling technologies and packages, such as vertical monitoring tools MWD/LWD technologies, and rotary steerable systems, enabling directional drillers worldwide to deliver wells on plan reliably. In addition, NOV delivers solutions across the entire bottomhole assembly, enabling directional drillers worldwide to be technical leaders while efficiently managing their inventory and working capital.

With access to world-class R&D facilities, the company focus solely on designing, manufacturing, and supporting their customers within the drilling industry with the technology and solutions they require to compete on a global scale. Since directional drilling operations

involve many risk factors and challenges, such as high temperatures, complex geometries, and unconventionals, NOV provide the solutions required for a broad range of applications such that operators successfully deliver wells on plan and maintain cost-effective deployment.

Wellsite Services

NOV Wellsite Services offers their expertise in four service lines, including solids control and waste management, fluid control, managed pressure drilling, and site services, with a focus on streamlining logistics and wellbore at the wellsite. Their advanced solutions are provided to customers on a global scale in all regions where drilling production is conducted, including Brazil, the U.S., the U.K., Norway, Egypt, as well as the Middle East and China. Wellsite Services solutions help maximize customer profitability and efficiency by separating solids and reusage of drilling fluids. The fluid control service line provide hands-on support to operators within the drilling production industry, ensuring optimal well completion, i.e., wells are brought in on time and according to budget. The managed pressure drilling service line helps operators around the world manage drilling operations with their solutions that consist of chokes, manifolds, and drilling control network integration systems and engineering. Lastly, the site services solutions consist of a strong portfolio of services, including resources to manage the entire wellsite lifecycle, water treatment, and logistics management, allowing operators in the industry to focus on the valuable resources at the well.

2.1.2 Share price trends

Figure 4 illustrates the historical stock price movement of NOV's stock since 2018. We can observe from eyeballing the graph that the stock´s price is highly volatile and has decreased significantly. As of January 17, 2023, the share price is $23,51 and has 392,8 million shares outstanding, this implies a market capitalization of approximately $9,240 billion (Yahoo, 2023). The stock price of NOV has been quite volatile over the past few years, reflecting the fluctuations in the oil and gas industry. The stock price has seen a decline in recent years due to the low oil prices, higher inflation, the COVID-19 pandemic, and Russia's invasion of Ukraine. However, as of January 17, 2023, the stock price has been recovering.

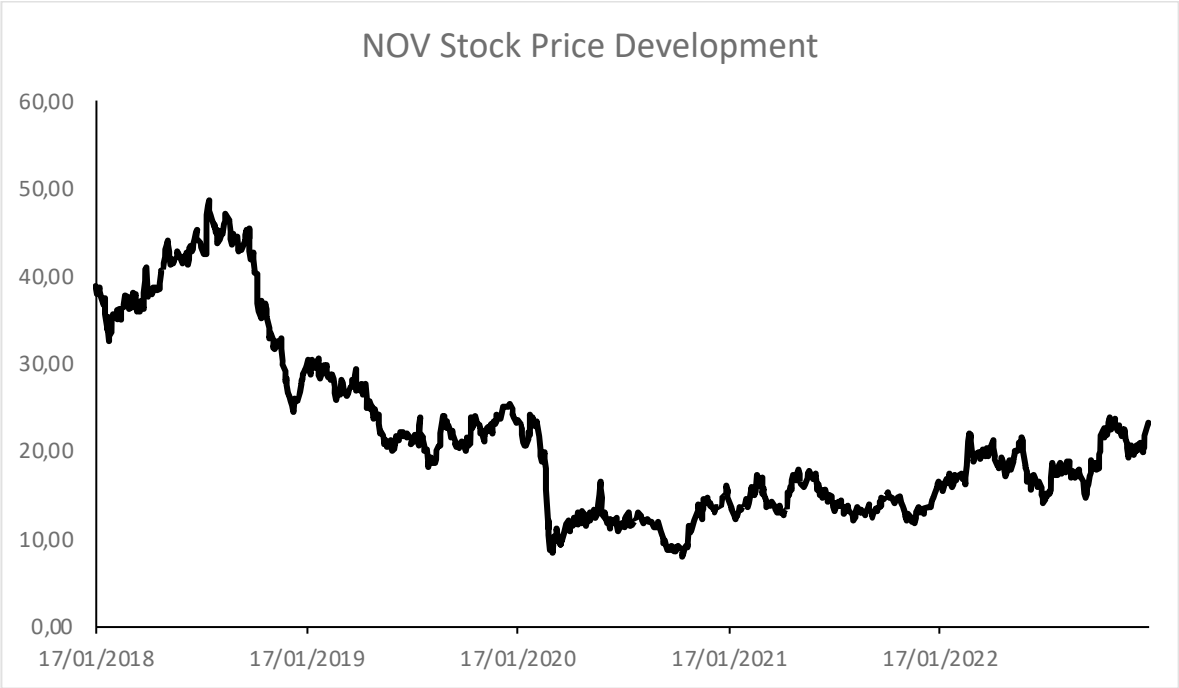

Figure 4: NOV's stock price has decreased significantly since October 2018
Source: (Yahoo, 2023)

2.2 The Oilfield Services and Equipment Industry and the Global Energy Market

The OFSE industry provides equipment and services to oil and gas exploration and production companies, i.e., the upstream sector of the global energy industry. Generally, we will find drilling, well intervention, stimulation, completion and a wide range of other oil and gas extraction services where there are oil and gas reserves. The sector comprises an extensive range of markets and value chains, each operating divergently depending on factors such as region of operation, business strategy, and the life cycle of the well. This complexity has resulted in the expansion of the industry to consist of over 40 value chains and over 100 services provided by thousands of firms with diverse profitability and business models (Seitz et al., 2020). While innovation in this industry has created considerable value, a significant portion of it has been relinquished to customers or outcompeted because of overcapacity and the absence of entry barriers in several regions.

2.2.1 Regions

Asia-Pacific

Rapid economic development in the Asia Pacific region has led to a surge in energy demand, making the countries in the region increasingly dependent on oil and gas imports. To reduce this reliance, nations in the Asia Pacific are enhancing their offshore exploration and production initiatives, with an aim to increase local energy supplies. Hence, due to the expansion of production and exploration in the oil and gas sector, the OFSE industry in the region is experiencing increasing growth potential.

The COVID-19 pandemic negatively impacted the OFSE sector in 2020, but the sector has rebounded to pre-pandemic levels since then. In the upcoming years, factors such as increased demand for advanced equipment, services, and solutions to enhance exploration and production efficiency both onshore and offshore are expected to drive the Asia-Pacific OFSE sector. However, volatile oil prices due to geopolitics, supply-gap and other factors have set back growth in the industry. Despite these challenges, the continuous demand for oil and gas has led to increased offshore exploration activities in Australia, Malaysia, and Indonesia, providing opportunities growth in these regions.

Drilling services represent the most significant portion of the OFSE market, as both drilling and completion services together contribute to over half of the market. In addition, as figure 5 illustrates, the average rig count has been consistently growing for the last five years in the Asia-Pacific region (Baker Hughes, 2023). The continuous demand for oil and gas solutions increased OFSE for higher production from existing and new wells, signaling growth in the Asia-Pacific OFSE sector. As of January 2023, Asia-Pacific accounted for the fourth-highest number of oil and gas rigs worldwide, with 204 rigs (ibid).

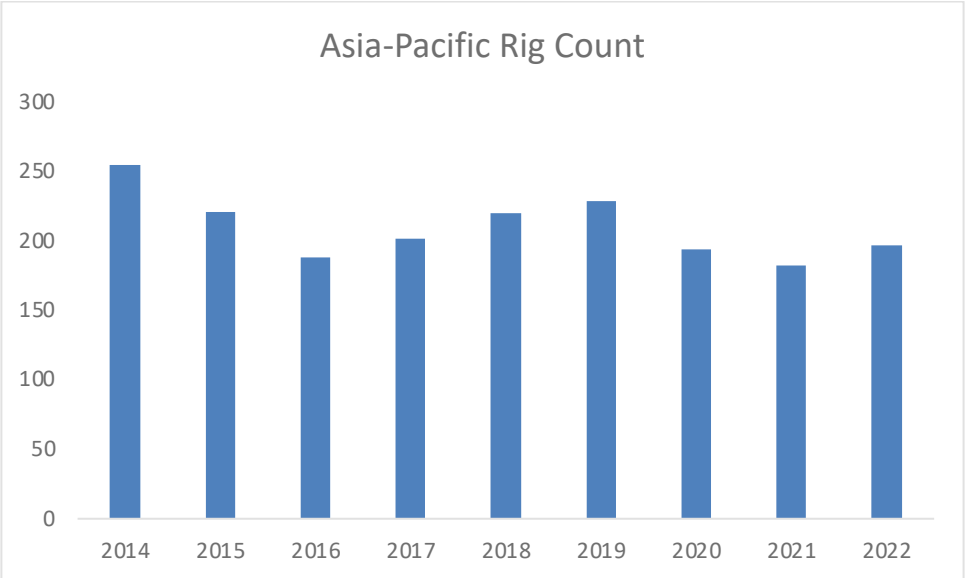

Figure 5: Figure illustrating the active rig count in the Asia-Pacific region. The rig count has been relatively stable between 2014 and 2022.
Source: (Baker Hughes, 2023)

In the Asia-Pacific, China is the largest market for OFSE and producer of oil. The country accounted for 38 active rigs in November 2022 and introduced 13 new oil and gas fields last year. However, to meet domestic demand, China relies heavily on oil and gas imports, particularly natural gas. In 2021, the country imported 72% of its crude oil supply and in 2017 they became the largest importer in the world (Xin, 2022). Hence, China has exploited its shale gas reserves and increased domestic gas production with 8,2% on a year-on-year basis to become more self-sufficient (ibid). Driven by increased investment due to growing energy demand, new reforms to help reduce the monopoly of state-owned companies, and Chinese oil and gas firms planning highest capital investment in history, China is expected to be the market leader for OFSE (Market Research, 2023).

India had 78 active rigs operating in its oil and gas fields in November 2022. Despite a decline in oil production due to aging fields and a scarcity of significant discoveries, both state-owned and private organizations have been investing in efforts to enhance recovery from these older fields. In April 2022 for example, the Oil and Natural Gas Corporation (ONGC), a state-owned oil and gas explorer, initiated two projects valued at USD 786.4 million to increase oil and gas production in the Mumbai High fields. The Indian government also granted 31 oil and gas contracts in the largest-ever offering via the third Discovered Small Fields (DSF-3) competitive bidding process. In addition, Petronas, a Malaysian oil and gas company, entered

into two agreements related to upstream investments in Malaysia, which further stimulated demand for OFSE in the region. The planned new investments, increasing productivity, and crude oil price stability in the region are anticipated to drive demand for OFSE in Asia (Market Research, 2023).

Europe

The COVID-19 pandemic highly influenced the OFSE industry in Europe, causing a decline in demand for crude oil and natural gas, as illustrated in figure 6. This decline led to a collapse in oil and gas prices, making upstream oil and gas activities riskier and financially unviable. Although European gas demand has declined and that energy demand in Europe has already peaked, according to DNV, global gas shipments are expected to grow by 12% due to the replacement of empty Russian gas pipelines by piped gas from the North Sea and other sources such as North America and the Middle East (DNV, 2023).

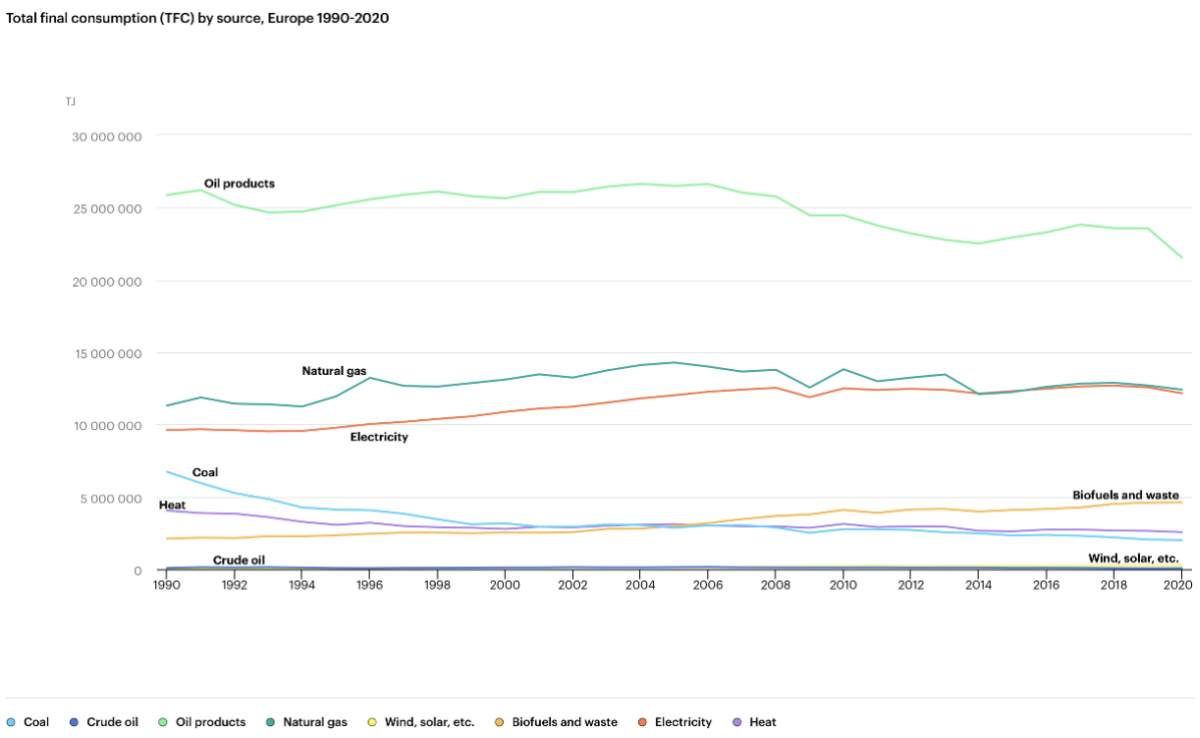

Figure 6: Energy consumption by source in Europe. Illustrates that the European energy demand in total has declined due to the pandemic, among other things.
Source: (IEA, 2022)

As figure 7 shows, the active rig count in Europe peaked in 2019 and has steadily decreased since then (Baker Hughes, 2023). However, the industry is anticipated to recover due to factors such as the exploration and development of oil and gas reserves in the region, accompanied

with the adoption of better technologies and solutions and higher energy prices. Moreover, the transition into renewables, both during and after the war in Ukraine, and the high volatility of crude oil prices may pose challenges to the growth opportunities in the industry. Due to increased access to new oil and gas exploration acreage in the region, the offshore activity in Europe is predicted to grow in the upcoming years (Market Research, 2023). Norway, in particular, is expected to see considerable growth, as The Ministry of Petroleum and Energy has recently licensed exploration and production activities in 28 new blocks in the Barents Sea (Regjeringen, 2022).

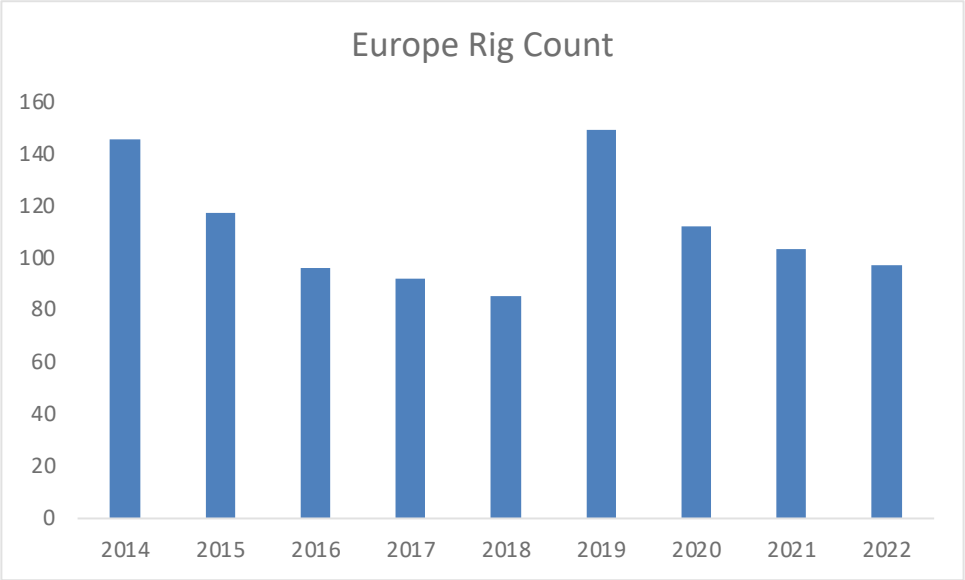

Figure 7:Figure illustrating the Europe rig count, showing that number of active rigs in Europe peaked in 2019 and has decreased steadily since then. The figure illustrates that the rig count in the region is quite volatile. Source: (Baker Hughes, 2023)

The North Sea encompasses the interests of several countries, especially European, and has significantly contributed to the European economy for over five decades. With an estimated 20-30 billion barrels of oil equivalent of undiscovered resources, the North Sea is a major offshore hydrocarbon basin in the region and presents enticing prospects. After breaking all energy links with Russia, the U.K. last year was developing a new energy strategy that involved increased North Sea oil and gas production to cut its dependence on imported gas, which resulted in an increase of 26% in domestic gas production (UK Government, 2022) & (Ravikumar, 2022). Although this strategy was mainly introduced to reduce dependency on Russian oil and gas, it could help the OFSE industry to recover after upstream oil and gas

companies receive their licenses to operate in the area. According to Aker BP's own investigation report on NOA Fulla, the company received a license to operate 13 exploration wells in the North Sea basin with a potential of 250-370 million barrels of oil equivalents (Aker BP, 2022). While also working on various projects in Norway, this is expected to surge the Norwegian offshore segment.

In recent years, we have seen substantial oil and gas discoveries in the Norwegian segment. The Johan Sverdrup field was one of them and is currently the third largest oil field on the Norwegian shelf, measured by barrels of oil equivalent reserves. Phase 1 started in October 2019 after the Norwegian Ministry of Petroleum and Energy announced 57 blocks in the 23rd licensing round back in January 2015 (NPD, 2019). 54 of these blocks are in the Barents Sea and three in the Norwegian See. In APA 2021, the Norwegian Ministry of Petroleum and Energy offered 28 companies a total of 53 oil and gas production licenses on the Norwegian shelf (Regjeringen, 2022). The last year, ConocoPhillips Scandinavia was offered a drilling permit on the Norwegian shelf by the Norwegian Petroleum Directorate (NPD, 2022). Hence, this, accompanied by the recent licensing announcement, is likely to stimulate growth in the European oilfield services and equipment sector.

Middle East and Africa

Like other continents and regions, the Middle East and Africa were negatively impacted by the COVID-19 pandemic in 2020. However, the region has now reached pre-pandemic levels, and is expected to grow significantly in the upcoming years. The upstream oil and gas industry is expected to increase oil and gas exploration and production due to higher energy demand and investments. Figure 8 illustrates how the final energy demand by carrier in the Middle East and North Africa region will develop looking forward (DNV, 2023). Following the energy transition and the dip under COVID-19 in 2020, DNV expects the final energy demand in the region to grow by 42% from 2020 and to peak in 2050, while the demand for oil and gas is expected to peak in the 2030s (ibid).

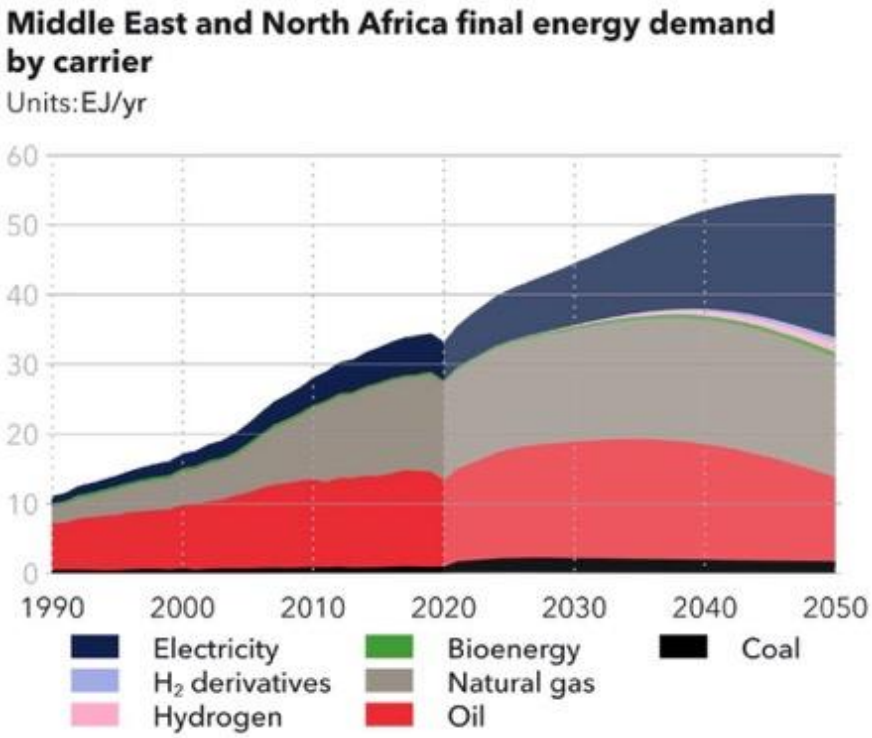

Figure 8: This figure shows the Middle East and North Africa final demand by carrier. The demand is expected to peak around 2050, while oil and gas demand is expected to peak in the 2030s in the region.
Source: (DNV, 2023)

In the Middle East and Africa there were 308 and 82 active rigs in 2022, respectively, as figure 9 shows (Baker Hughes, 2023). We observe a steady decline in active rigs in both regions since 2014. As both continents are expected to increase investments, as well as oil and gas exploration and production, one would expect that the rig count will increase significantly in the upcoming years. In addition, as reported by DNV, oil and gas demand in the regions and the emerging markets will significantly increase the next decades (DNV, 2023). This would, in turn, increase the demand for the OFSE sector. This is anticipated not only because the energy sector is expected to boom and grow over the next ten years, but also due to expected increases in foreign investments, accelerated scale-ups, and rising exports (EIU, 2022; IEA, 2022).

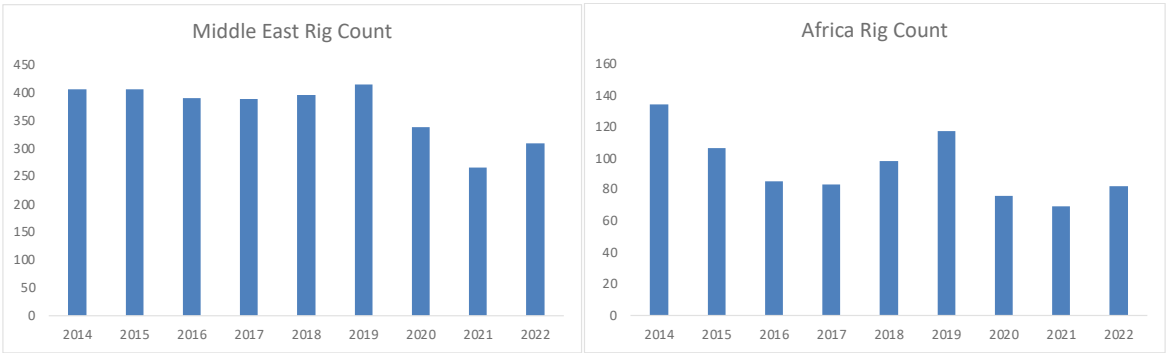

Figure 9: The figure on the left-hand side illustrates the active rig count in the Middle East, which has decreased since the peak in 2019. The rig count in the Middle East has been quite stable, compared to the Africa rig count, which is illustrated on the right-hand side. Between 2014 and 2022, the rig count in Africa has witnessed a steady decline.
Source (Baker Hughes, 2023)

The current global energy crisis has highlighted the need and advantages of rapidly expanding affordable and sustainable energy sources. The ongoing conflict between Russia and Ukraine has resulted in skyrocketing prices for food, energy, and other commodities, putting additional pressure on the African economy already impacted by the Covid-19 pandemic. These factors have in turn led to 4% more people without electricity in 2021 compared to 2019 and thus reversing the positive trends in African economies. In the Sustainable Africa Scenario (SAS) by IEA however, the African population will gain universal access to affordable electricity by 2030. Figure 10 shows that people in electricity-deprived areas, stand-alone systems, and mini grids accounts for 80% of the total population that lacks access to electricity (IEA, 2022).

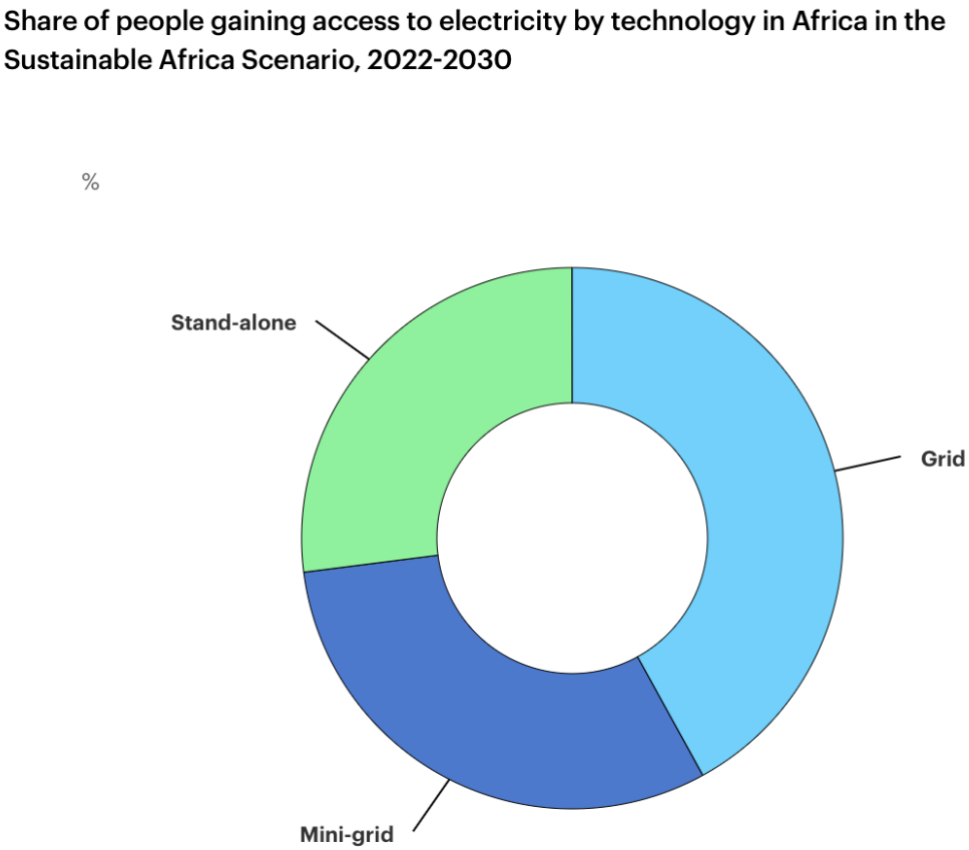

Figure 10: This figure illustrates the share of people in Africa, broken down by technology, who are projected to gain access to affordable electricity by 2030, according to the Sustainable Africa Scenario by IEA. Currently, there are still 43% of the total population in the region who do not have access to electricity.
Source: (IEA, 2022)

In the Middle East, Egypt and Saudi Arabia are the leading front runners in the industry. For instance, the Egyptian market is expected to grow by 5%. However, the Egyptian economy grow by 6,5% the year before COVID-19 and thus one could expect to see a higher growth rate in the upcoming years. Climate issues are affecting the region as well due to large oil and gas exports. Therefore, long term energy transition is expected to drive the industry, providing a stable supply of energy to the world economy. The sovereign wealth funds in the region, such as UAE, Saudi Arabia, Kuwait, and Qatar are expected to increase their invest in oil and gas exploration and production largely. Morocco, Tunisia, Lebanon, and Egypt are highlighted as the countries that will drive the industry in the upcoming years due to oil and gas developments and large oil and gas reserves. However, on shorter term, there are still

difficulties in the industry regarding economic stability and shocks due to the COVID-19 pandemic and the Russia-Ukraine war (Alterman, 2023).

South America

The South American region is affected not only by the ongoing war in Ukraine, but also by the long-lasting consequences of the COVID-19 pandemic. Factors such as high inflation, a stronger US dollar, higher borrowing costs, and high energy prices have weakened the global economy. These factors have also downgraded the economic forecast for the South American region by 2,7%. As a result of the Russia-Ukraine war and the delivery delays and expensive export costs due to the COVID-19 pandemic, the Latin American inflations rates are higher than observed in several decades. This is illustrated in figure 11 below. However, the Latin American energy demand is expected to recover by 2024 and grow in the upcoming years, according to the Deloitte Latin America economic outlook, January 2023 (Deloitte, 2023).

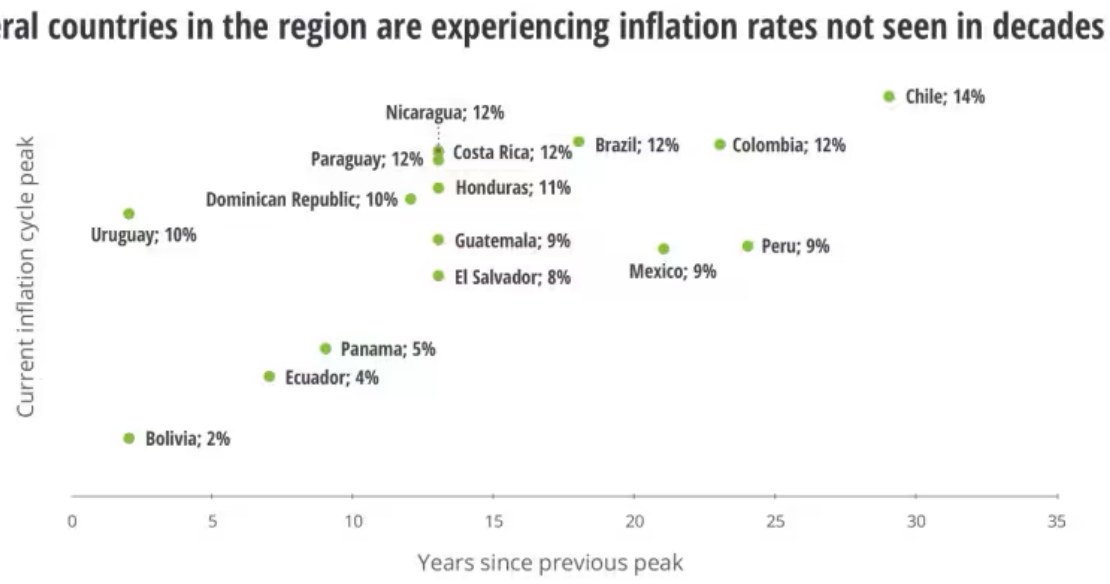

Figure 11: Figure that illustrates the inflation rate in Latin American countries. Argentina and Venezuela are not included in the figure, with 83% and 4310% current inflation cycle peak and 30 and 1 year since the previous peak, respectively.
Source: (Deloitte, 2023)

In 2022, there were 168 active rigs in the Latin America, and the active rig count has decreased significantly since 2014, as illustrated in figure 12 (Baker Hughes, 2023). The 2023 outlook for the region is quite more negative than for the 2022 outlook due to fears of recession, which in turn has decreased global demand. This has resulted in much lower oil, as well as other

commodity prices, e.g., oil prices have decreased by 27%, while silver and gold are down by 25% and 14%, respectively since the peak in 2022. Due to these types of exports being the main exports of Latin America and accounting for a large share of GDP, drops in oil and other commodity prices usually signal an economic downturn in the region (Deloitte, 2023).

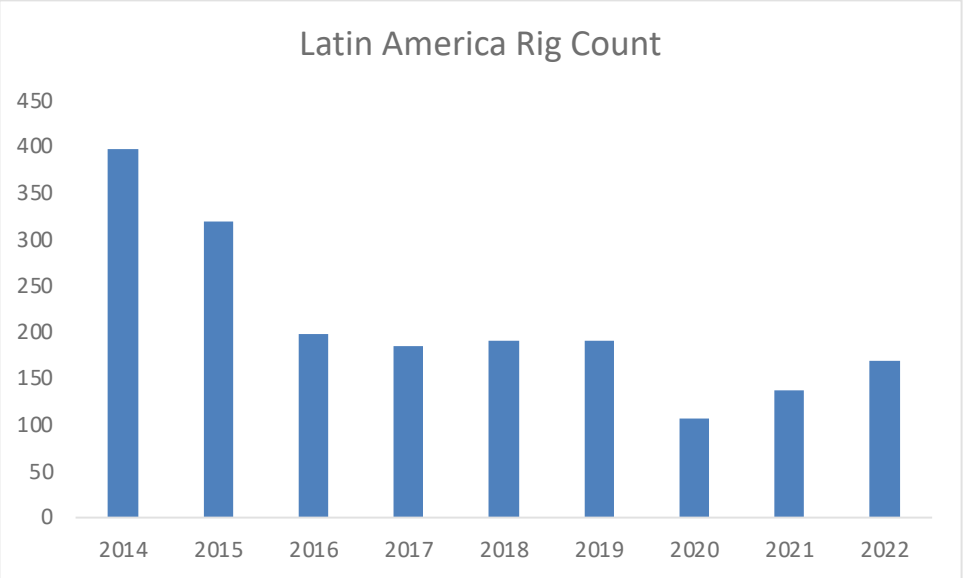

Figure 12: The figure shows the active rig count in Latin America from 2014 to 2022. From 2014, there has been a steady decline in active rigs in the region.
Source: (Baker Hughes, 2023)

The pandemic and recent downturn in Latin American economies exposed the risk of the offshore strategy in the past, such as delays, and export suspension to China. Hence, the industry has been adopting a nearshoring strategy, i.e., centralizing the global economy around North America, Europe, and East Asia, which especially Mexico gains a lot from. This is because of its strategically position next to the U.S., resulting in high foreign direct investments inflows into Mexico. The Mexican states bordering the U.S., i.e., Baja California, Chihuahua, and Nuevo Leon witnessed an increase of 54%, 6%, and 4% of foreign direct investments inflows, respectively. According to the InterAmerican Development Bank, the nearshoring strategy could increase Mexican exports by $35 billion, while Brazilian exports could increase by $7,8 billion. In the same estimates, they argue that the Latin America exports could increase by a total of $78 billion (World Bank, 2022).

North America

North America is recognized for its high adoption of advanced technologies, supported by government policies that encourage innovation and robust infrastructure (The White House, 2023). However, any factors impacting the performance of industries in the region can negatively affect economic growth. The U.S., currently the country most severely affected by the COVID-19 outbreak, has seen government-imposed restrictions on various activities to curb the spread of the virus, including aggressive testing, travel suspensions, mandatory quarantine, and stay at home orders (Statista, 2023) & (U.S. Department of Defense, 2023). This has led to the oil sector experiencing its third price crash within a year.

While the industry managed to recover from the first two shocks and return to normal operations, the current situation is distinctly different. A combination of supply shortages, unprecedented low demand, and a global humanitarian crisis have arisen due to the ongoing COVID-19 pandemic. As the economy continues to struggle, the U.S. oilfield services industry has faced increasing job losses, with states like Texas, Louisiana, Colorado, Oklahoma, and New Mexico being the most severely impacted.

The prospects for the U.S. economy for 2023 are less promising than those for 2022 due to an increasing belief for a recession. According to Goldman Sachs and Bloomberg, the probability of a U.S recession is the highest in a decade, with a probability of 55% and 60,5%, respectively (Goldman Sachs, 2023) & (Deloitte, 2023). This has weakened the global demand, causing decreasing prices of oil and other commodities. The exception is gas, which rose by 79% and 109% in the U.S and Europe, respectively, since the start of the Russia-Ukraine war, according to Deloitte (Deloitte, 2023). As seen in figure 13, the North American rig count has decreased steadily since 2014 (Baker Hughes, 2023), due to underinvestment and global crisis' the past decade. However, the North American oil and gas industry is expected to maintain the healthiest balance sheets in 2023 and continued capital discipline, enabling the energy transition towards more sustainable and cleaner energy solutions. In the 2023 outlook survey by Deloitte, 93% of respondents remain positive about the industry's prospects (Deloitte, 2022).

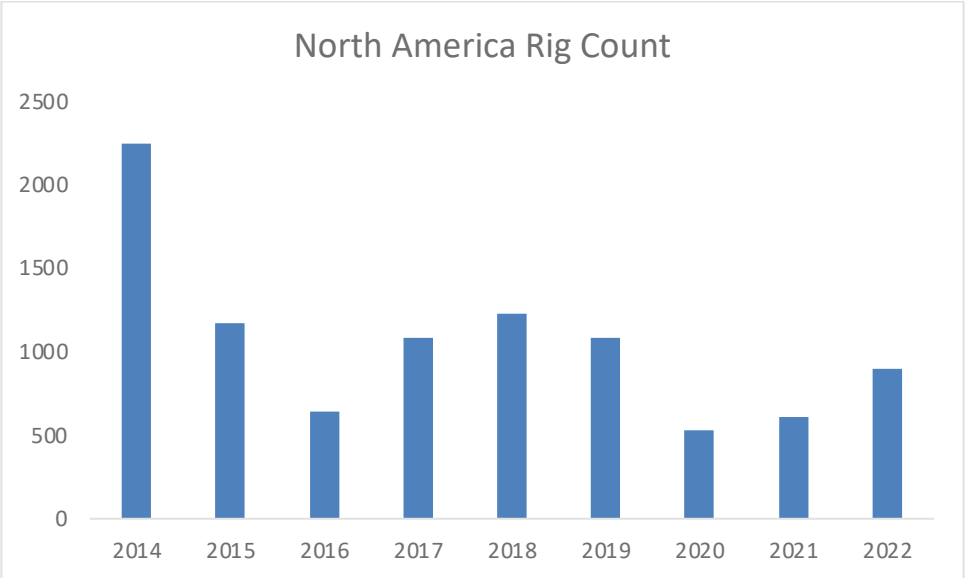

Figure 13: Overview of active rig count in the North American region from 2014-2022.
Source: (Baker Hughes, 2023)

2.2.2 Key Value Drivers

The OFSE industry is cyclical in nature, i.e., highly correlated with activity level and capital spending budgets of oil and gas exploration and production companies, as well as expectations of oil and gas prices. (BVR, 2017) identified seven key value drivers in the OFSE industry, including upstream capital spending, location, fixed costs, cost efficiencies, technology, customer relationships, and balance sheets.

Upstream capital spending

Upstream capital spending refers to the amount of money that oil and gas exploration and production companies invest in oil exploration and extraction solutions, i.e., technologies and equipment. As such, it has a significant impact on the OFSE industry, which provides the services and equipment necessary for these activities and is in turn heavily dependent on oil and gas price expectations. The relationship between global investments in oil and gas upstream and crude oil prices is illustrated in figure 14 (IEA, 2020) & (Macrotrends, 2023). Any reduction in the capital expenditures of these customers directly affects the demand for OFSE's products and services. If there are cuts in capex spending, the revenue of the OFSE sector reduces faster than that of the Exploration and Production (E&P) operators. This

happens because the producers can reduce their purchases and renegotiate or cancel the short-term supply and service contracts when the prices of oil and gas fall.

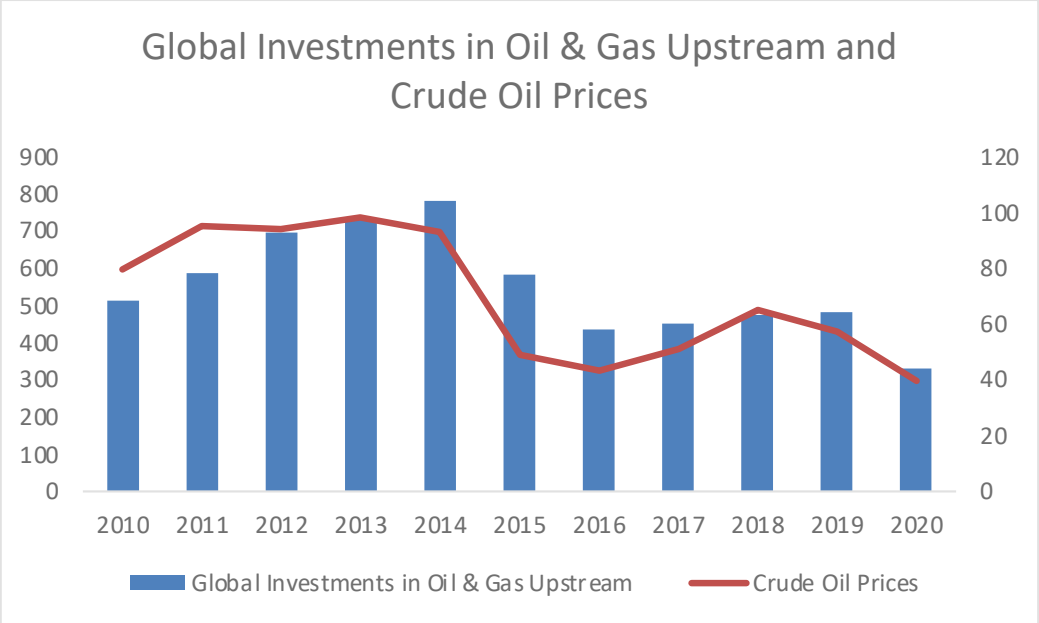

Figure 14: Global investments in oil and gas upstream in nominal terms and crude oil prices between 2010 and 2020 is illustrated in this figure. Exploration and production capital spending is heavily influenced by crude oil price expectations.
Source: (IEA, 2020) and (Macrotrends, 2023)

When capital expenditure in the industry increases, the demand for OFSE products and services also increases, leading to higher revenue and returns for OFSE companies. Conversely, when upstream capital spending decreases, OFSE companies may experience lower demand for their products and services, leading to reduced revenue and profitability. In addition, when oil and gas prices increase the supply increases because of greater exploration and drilling activity. However, exploration activity will eventually decrease if prices decline due to insufficient increase in demand. As figure 15 shows, we find strong correlations between OFSE demand and OSX Index, as well as crude oil prices, respectively. As a measure for global OFSE, rig count is used, as this is the leading indicator for global OFSE demand.

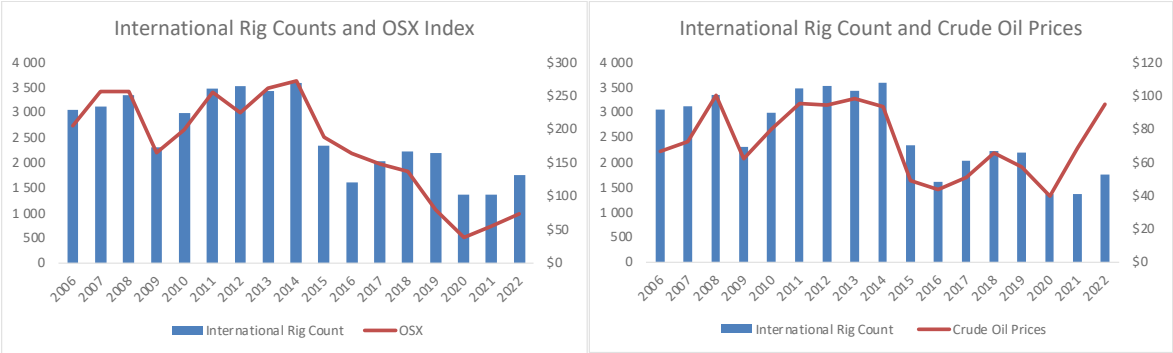

Figure 15: These two figures show the relationship between international rig counts and the OSX index and oil prices between 2006 and 2022, respectively. We clearly see that there is a strong relationship between both international rig counts and the OSX index, as well as between international rig counts and crude oil prices.
Source: (Baker Hughes, 2023), (Yahoo, 2023) & (Macrotrends, 2023).

Location

The location of oil and gas exploration and production activities plays a crucial role on demand for OFSE. Different regions possess unique geological characteristics, regulatory environments, and infrastructure, which in turn influence the demand for different types of OFSE solutions. In mature markets such as North America and the North Sea, the focus may be on maximizing extraction from existing reserves and developing unconventional resources like shale gas, which in turn can lead to higher demand for drilling equipment and technologies. In contrast, emerging markets in regions such as Africa, South America, and the resource-rich countries in Asia and Middle East may prioritize exploration and the establishment of new infrastructure, as well as joint ventures with OFSE multinationals in important value-adding activities (Tordo et al., 2013). As a result, companies operating in these regions might require different types of OFSE services, such as, drilling services, seismic data acquisition, and the installation of production facilities. Furthermore, the accessibility of OFSE companies to their customers´ operations can greatly impact the cost and efficiency of service delivery, as transportation and logistics play an important role in this industry. Hence, the location of both the service providers and the areas of operation are key value drivers in the OFSE industry.

Fixed costs

Fixed costs play an important role in shaping the competitive landscape and financial performance of the OFSE industry. This industry can be highly capital-intensive, and fixed

costs typically consist of expenses such as infrastructure and equipment, including fixed assets that accompany drilling and related services, that remain constant regardless of activity level. These costs can heavily impact the profitability of OFSE companies, particularly during cyclical downturns when there is a decline in demand for services and equipment. As we have seen during the 2014-2015 crisis and COVID-19, OFSE companies with high fixed costs can reduce profit margins, limit financial flexibility, and put pressure on companies to reduce operational costs or increase efficiency (Ati et al., 2016). Conversely, OFSE companies with lower fixed costs can better weather these cyclical downturns, as they can maintain their profitability even when demand is low. Furthermore, OFSE companies with lower fixed costs may have a competitive advantage in securing new contracts, as they can offer more attractive pricing without compromising their financial stability. Hence, the management of fixed costs is a crucial factor in determining the resilience and success of companies operating in the OFSE industry.

Cost efficiencies

Cost efficiencies in the OFSE industry can directly influence the competitiveness and profitability of companies this sector and refers to the effective management and optimization of resources, enabling companies to deliver their upstream oil and gas solutions at lower costs without sacrificing quality. As the industry experiences fluctuations in demand due to shifts in upstream capital spending and oil and gas prices, the ability to maintain cost-efficient operations becomes critical for continued growth and profitability, as well as the ability to operate sustainable over the long term and to thrive in a low-price environment for years (Phillips & Jackson, 2015). Hence, OFSE companies that achieve high levels of cost efficiency can better navigate the downturns in the industry by maintaining profitability even when revenues decline, which in turn provides a competitive advantage when bidding for contracts. In addition, the savings from optimized operations can be reinvested into R&D to strengthen their technology and engineering capabilities. Ultimately, in the OFSE industry, cost efficiencies contribute to a company's resilience and capacity to succeed amidst a fiercely competitive and cyclical landscape, establishing it as a crucial value driver for stakeholders to consider.

Technology

Technology drives innovation, enhances operational efficiency, and influences the competitive dynamics within the OFSE industry. Technological advancements in the OFSE

industry can lead to the development of cutting-edge equipment, tools, and processes, enabling the upstream oil and gas companies to improve oil and gas exploration and production activities in addition to reducing costs and environmental impact. For example, hydraulic fracturing has revolutionized the oil and gas industry by allowing for the extraction of hydrocarbons from deep underground shale formations, leading to the American petroleum boom after the 2008 recession. This lowered the price of oil and gas around the world and improved the U.S. competitiveness in the global economy in addition to reducing greenhouse gas emissions (Merrill & Schizer, 2013). While hydraulic fracturing itself has been criticized for its environmental impact, ongoing technological advancements aim to reduce these concerns by minimizing water usage, improving wastewater treatment and well integrity, as well as reducing the risk of methane leaks (Essien et al., 2022).

By investing in R&D and technology, OFSE firms can address some of the challenges associated with the cyclical nature of the OFSE industry, i.e., reduce the impact of market volatility and maintain a more stable revenue stream. For example, the adoption of digitized operations, automation, and data analytics allows OFSE companies to streamline operations, improve decision-making, and enhance safety standards, thus contributing to overall cost efficiency and increased profitability.

Customer relationships

Customer relationships hold significant importance in the OFSE industry, as they contribute to the long-term success and stability throughout the operational lifecycle of a well. In the OFSE industry, establishing and maintaining strong relationships with oil and gas exploration and production companies, as well as growing service and product offerings that are synonymous with safety and performance is crucial for securing contracts, driving revenue, and fostering customer loyalty. With this strategy, OFSE companies gain valuable insights into their clients' evolving needs and preferences, enabling them to develop innovative solutions and services that address emerging challenges and trends, such as the increasing volatility in the market, cyclical downturns, and accelerating global energy transition (Ati et al., 2021). By providing exceptional service, solutions that meet specific customer needs and on-site conditions, as well as technical expertise and support, OFSE firms can build trust and credibility with their clients, which in turn can lead to repeat business and ongoing partnerships. Hence, the OFSE firms that can manage to prioritize customer relationships and

their specific requirements are better positioned to handle downturns and fluctuations in demand and when the market is experiencing a decline in activity.

Balance sheets

Balance sheets provide insight into a company's financial health and stability, which are important factors when navigating the cyclical nature of the OFSE sector. A robust balance sheet is characterized by manageable debt levels, and a solid equity base, all of which contribute to a company's ability to withstand downturns and seize growth opportunities during upturns in the OFSE industry. During periods of decreased demand and reduced capital spending by oil and gas exploration and production companies, firms with strong balance sheets can better stand the challenges by relying on their financial reserves and flexibility. This enables them to maintain operations, continue investing in research and development, and potentially capitalize on strategic acquisitions or other growth opportunities when competitors may be struggling.

In addition, when operating activity, oil prices, and equity value decline or they are facing growth opportunities, studies suggest that oil and gas companies tend to increase their leverage and thus financing decisions have an impact on probability of distress (Chung et al., 2013 in Restrepo et al., 2020) & (Narayan & Nasiri, 2020). The studies also indicate that debt is used to fund the exploitation of depleting assets, i.e., oil reserves (Filbeck & Gorman 2000 in Restrepo et al., 2020). As figure 16 illustrates, the debt ratio for energy firms and non-energy firms have co-moved differently according to the West Texas Intermediate (WTI) oil price. In fact, the WTI oil price is twice as much correlated with energy firms, compared to non-energy firms. Hence, the speed of adjustment to leverage for energy firms when exposed to oil market activities is likely to be different when comparing to non-energy firms (Narayan & Nasiri, 2020).

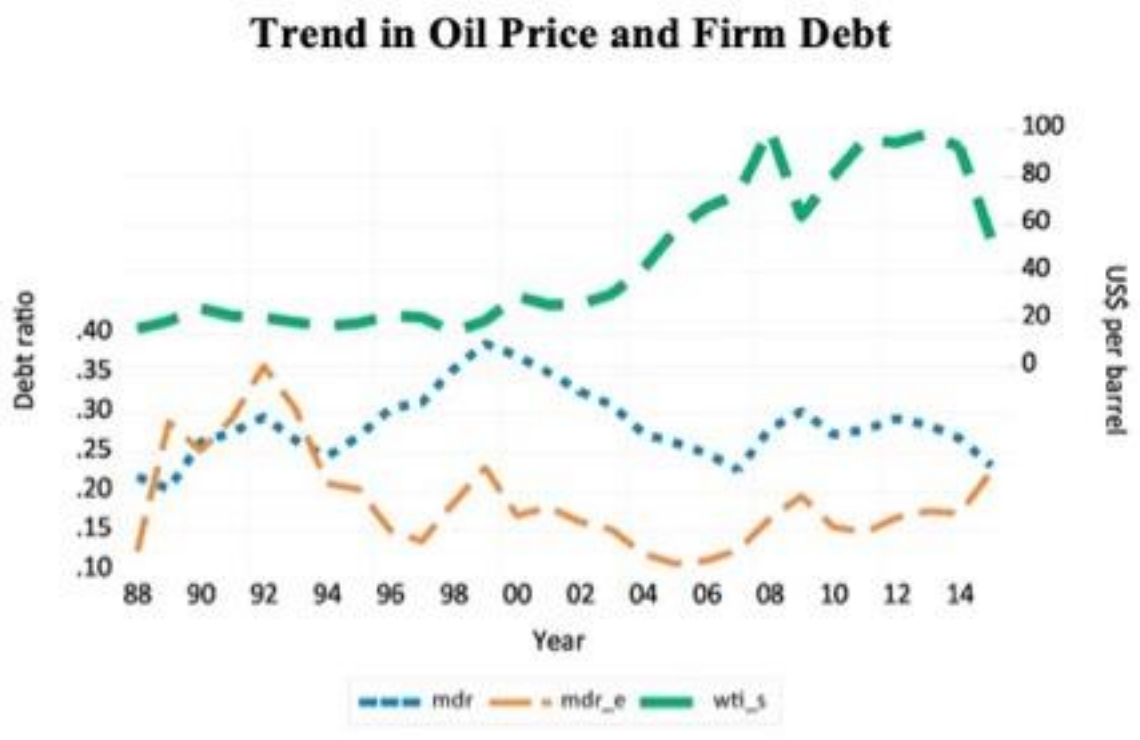

Figure 16: This figure shows equal-weighted time-series data on market debt ratio for energy (mdr_e) and non-energy (mdr_e) and the WTI oil price. The mdr_e and mdr_e data are based on equal-weighted averages of debt from 1988 to 2015 for 726 firms (from 56 countries) and 32.382 firms (from 108 countries), respectively.
Source: (Narayan & Nasiri, 2020)

2.2.3 History and Outlook

As observed during the structural industry change between 2014 and 2016, a huge decrease in oil and gas demand and the Organization of the Petroleum Exporting Countries' (OPEC) decision to maintain its production level at 30 Mb/d in 2015, led to weakening of market fundamentals and a drop in oil prices. During this crisis, the oil price fell from $115/barrel in June 2014 to below $35/barrel in February 2016. The significant drop in oil prices resulted in a more vulnerable hence riskier oil and gas industry, which in turn lead to declining credit ratings, making debt financing more costly (Teti et al., 2020 in Narayan & Nasiri, 2020). This crisis had a big impact on the oil and gas industry, which in turn resulting in 35 oil and gas companies with a cumulative debt of $18 billion filed for Chapter 11 Bankruptcy protection in the U.S. (Restrepo et al., 2020).

The past decade, the industry has seen several peaks and troughs because of several financial, economic, trade policy, and geopolitical factors, including COVID-19, Russia-Ukraine war, as well as disruptions amid underinvestment in the oil & gas industry that has taken oil prices to new highs with high price volatility. As a result, the industry has been compelled to navigate through periods of both overcapacity and supply shortages, which have ultimately reshaped the global energy landscape and influenced strategic decision-making among industry stakeholders, as illustrated in figure 17 (Seitz et al., 2020). Between 2005 and 2014, the oil and gas sector had a robust compound annual growth rate of approximately 12% in upstream capital expenditure and market capitalization peaked at about $380 billion in 2014. This remarkable growth was supported by technological advancements and scale economics in areas such as deepwater, horizontal, and extended-reach drilling. Furthermore, the adoption of unconventional techniques enabled the industry to tap into new resources at increasingly competitive costs (Seitz et al., 2020). In this complex environment, ensuring energy security and resilience while transitioning towards more sustainable energy sources has become increasingly challenging, as the sector continues to adapt to new market dynamics and navigate an uncertain future.

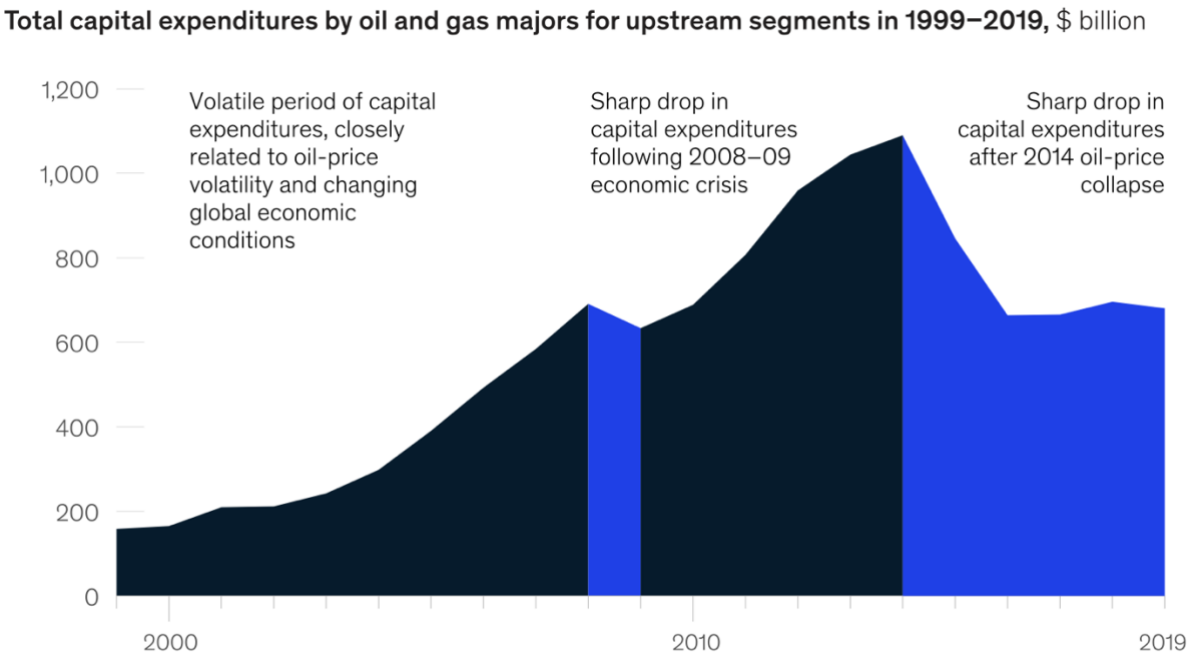

Figure 17: Total CapEx in the industry grew steadily until the financial crisis in 2008-2009, causing a significant drop in CapEx. The CapEx in the industry grew by approximately 12% between 2005 and 2014, resulting in overcapacity. Following the oil-price collapse in 2014, margins were squeezed, and CapEx decreased significantly.
Source: (Seitz et al., 2020).

When examining the OFSE industry, it is evident that between 1990 and 2005, the total returns to shareholders (TRS) in the OFSE industry were approximately equal to the S&P 500 index, as well as other oil and gas industries. This is illustrated in figure 18. During this period, OFSE firms invested in capacity and solutions because of the rising demand projections and the operators' prioritization of exploration and reserve accretion, resulting in steady growth. Between 2005 and 2014, however, there was an increasing growth in capital expenditure (CapEx) in the industry, with a compound annual growth rate of about 12%, causing an increase in oil and gas industry revenue from approximately $300 billion to over $1 trillion. The TRS in the OFSE in the same time span outperformed both the S&P 500 index and other oil and gas operators, as the figure below shows. In 2014, the market cap reached a peak of approximately $380 billion, due to innovation in the oil and gas solutions and technologies, as well as scale economies in various drilling techniques. This resulted in the discovery of new resources at higher prices (ibid).

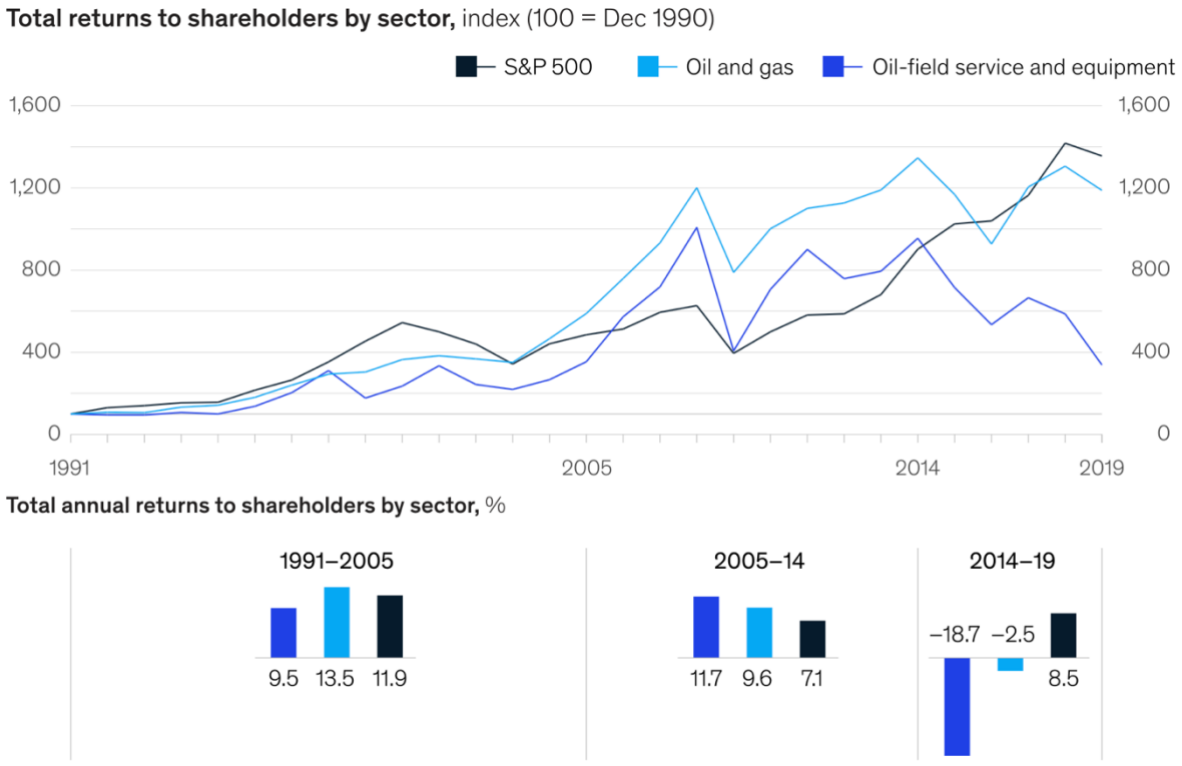

Figure 18: TRS in the OFSE industry were in line with the TRS for operators in the S&P 500 index, as well as other oil and gas sectors. TRS in the OFSE sector have decreased more than both operators in the S&P 500 index and other oil and gas operators since 2014.
Source: (Seitz et al., 2020).

The series of disruptions amid underinvestment in the industry, including capex cuts in 2014-2016, OPEC oversupply in 2015-2016, drone attacks on Saudi Aramco´s facilities in 2019, COVID-19 and the following crash in prices in 2020, and ongoing inflationary pressures, conflicts, policy, and trade shifts, have triggered a readjustment in the market. For instance, European natural gas prices have risen to nearly 10 times that of the U.S. and higher than brent crude oil from January 2021 to June 2022. In addition, we have seen that the energy transition faces energy security risks, with an ongoing supply chain disruption, as well as limited supply of crucial materials and high raw material prices, putting pressure on renewable energy projects. Moreover, Russia's crude to Asia is at a significant discount and subsidies have led to increasing disparity in profitability and prices between European, Asian, and the U.S. refiners.

Despite fears of recession and tight U.S. Federal monetary policy, we can observe that the underlying supply crunch and trade flow disruption are driving higher short-term prices, resulting in oil and gas producers to report highest-ever free cash flows globally in 2022 (Deloitte, 2022). In addition, as illustrated in figure 19, the industry is in a strong position for the upcoming years, due to its healthy financial state and industry-leading returns. Furthermore, the figure shows that the industry has been reducing its debt, increasing efficiency, and practicing capital discipline since 2014 (Deloitte Insights, 2022). The industry has had to adapt and adjust to these changing market conditions, with the OFSE firms focusing on reducing debt, improving efficiency, and exercising capital discipline in order to remain competitive. As a result, the OFSE sector is now positioned for growth and has the potential to capitalize on emerging opportunities, while continuing to navigate the complex landscape of energy security risks, supply chain disruptions, and evolving global energy policies.

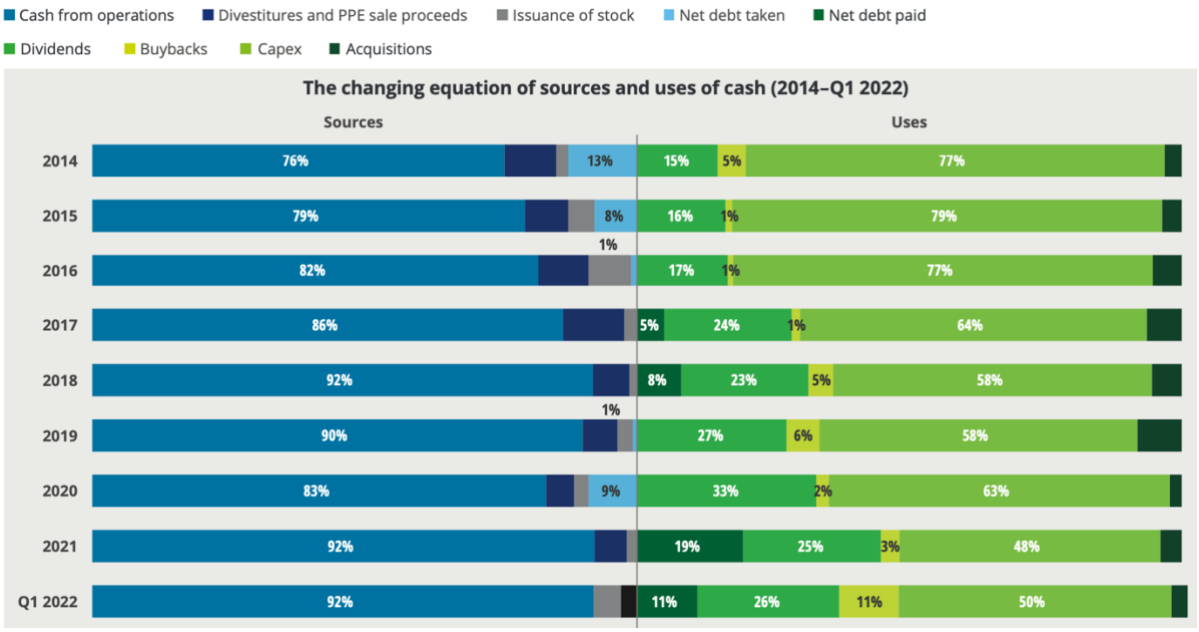

Figure 19: Figure illustrating that since 2014, the industry has been reducing debt, increasing efficiency, and practicing capital discipline.
Source: (Deloitte, 2022)

2.3 Competition

The competition in the OFSE industry is characterized by intense competition among a diverse set of global and regional players providing a wide range of upstream oil and gas technologies, equipment, product, and solutions. Major companies such as Schlumberger, Halliburton, and Baker Hughes, as well as NOV, dominate the market with their comprehensive solution portfolios and technology, in addition to a strong international presence. These three firms share many of the same characteristics as NOV and are also publicly listed. In addition, these three firms operate in the same segments as NOV, and they are NOV's main competitors. Hence, these three firms suit quite well for a direct comparison and will be discussed more in detail in the next section. The smaller, specialized firms compete by focusing on niche areas, offering parts and specific solutions. The market dynamics are shaped by factors such as fluctuating oil prices, regulatory changes, geopolitical developments, and the ongoing energy transition towards sustainable and cleaner energy sources, which drives the industry to adapt and innovate continuously.

2.3.1 Haliburton

Halliburton is one of the leading providers of equipment and services in the OFSE industry. The company has a diverse product portfolio, consisting of well construction and completion, subsurface, software, production, and abandonment products, as well as integrated services (Halliburton, 2023). These products and services are supported by advanced technologies and highly skilled engineers, which enable the company to provide quality solutions to the upstream oil and gas industry. The company has a strong global presence with 70 countries covered by their diverse product line and upstream oil and gas services (Craft, 2023).

Halliburton's extensive experience and deep understanding of the industry have positioned it as a key player in the global OFSE industry with a market capitalization of $38,36 billion as of January 17 (YCharts, 2023). The company's strong financial performance and focus on innovation, has allowed the firm to remain competitive in the recent difficult times due to fluctuating oil and gas prices, as well as evolving market dynamics (Halliburton, 2022). By prioritizing strategic partnerships and expanding its service offerings, Halliburton has successfully managed to diversify its client base and reduce dependency on any single market or client, as well as strengthen its position in the OFSE industry. One of the most notable strategic partnerships, is the strategic partnership Halliburton formed with Microsoft and Accenture back in 2020 to enhance their digital transformation and improve operational efficiency by leveraging Microsoft's Azure cloud, IoT solutions, and Accenture's industry expertise (Accenture, 2020). Other notable strategic partnerships involve AkerBP and TechnipFMC. The partnership with AkerBP is supposed to deliver a new field development planning application, while the partnership with TechnipFMC is a long-term technology alliance lasting over five years that enhances the development and commercialization of new technologies by inventing integrated production solutions that span subsea and subsurface applications (Halliburton, 2022) & (TechnipFMC, 2022).

2.3.2 Schlumberger

Schlumberger is a global leader in the OFSE industry with operations in 120 countries worldwide (SLB, 2023). As of January 17, the company had a market capitalization of $83,02 billion making them a key player in this sector (YCharts, 2023). The firm offers a wide range of products and services across its main business segments, namely Digital and Integration, Reservoir Performance, Well Construction, and Production Systems. Schlumberger's success

can be attributed to its commitment to innovation, significant investments in R&D, and strategic partnerships with other industry leaders. For instance, the company has accelerated the adoption of AI for energy companies and has strategic partnerships such as innovation co-developments with Equinor, Petoro, and ADNOC (SLB, 2023). These efforts have enabled the company to develop an extensive suite of technologies for the energy industry, as well as solutions for optimizing well completion and production for its diverse customer base. This includes national oil companies, independent operators, and international oil and gas majors. As the oil and gas industry and energy markets continue the energy transition towards cleaner energy technology and reducing carbon emissions, Schlumberger remains well-positioned to adapt to the market changes in the global OFSE industry (Nasdaq, 2022).

2.3.3 Baker Hughes

As a key player in the OFSE industry, Baker Hughes conducts business in over 120 countries worldwide and has a history lasting over 100 years. Baker Hughes has a market capitalization of $31,67 billion as of January 17. The company operates within two main segments, oilfield services & equipment and industrial & energy technology (Baker Hughes, 2023). The company offers technology and solutions such as drilling, well completions, artificial lift, and production optimization. Baker Hughes distinguishes itself through its focus on innovation, sustainability, and environmental responsibility. For instance, Baker Hughes has introduced the NovaLT gas turbine, a product designed for high efficiency and low emissions (Baker Hughes, 2023). Furthermore, Baker Hughes has proven resilience by adapting to the constantly changing energy industry and seizing emerging opportunities by investing in renewable energy and focusing on digital solutions.

Baker Hughes has expanded their portfolio with the launch of the "Energy Forward" strategy, which includes developing offshore wind turbine technology and advancing carbon capture and storage solutions (Baker Hughes, 2020). The company’s emphasis on digitalization and remote operations has allowed it to address the increasing demand for data-driven solutions and to enhance the safety and efficiency of its services. One example is through the creation of the BHC3 AI Suite, which provides data-driven applications to optimize oil and gas operations and improve productivity (BakerHughesC3.ai, 2023). Other notable examples are through recent strategic partnerships, such as a strategic investment and collaboration with Corva and Amazon Web Services (Baker Hughes, 2023).

Corva is based in Houston and delivers cloud-based well construction digital solutions to improve decision making and rig visualization though the lifecycle of the well. With this partnership, they will deliver digital applications for oil and gas operations, such as enhancing digital capabilities for well construction. This will drive more intelligent and efficient operations, and enabling operators to drill faster, better, and more accurately (ibid). The partnership with Amazon Web Services is supposed to develop a cloud-based automated field production solution. This solution enhances performance and energy efficiency by automating field production, while lowering emissions. Additionally, it minimizes health and safety risks by reducing the need for on-site visits to the field (Baker Hughes, 2023). As the industry continues to undergo transformation and several transitions, Baker Hughes seems to be well-positioned to use its expertise and technological abilities to tackle the different challenges in the energy industry.

3. Valuation Methods

At this point, I have presented NOV and discussed the mechanisms of the OFSE industry. This section will introduce the different valuation approaches that could be used for a proper fundamental valuation of NOV. This will serve as a basis for the choice of valuation technique in this valuation of NOV.

According to Professor of Finance Aswath Damodaran at the Stern School of Business at New York University, there are three main valuation methods, namely discounted cash flow valuation (DCF), relative valuation, and contingent claim valuation. In this context, the DCF approach refers to all valuation techniques when intrinsic value is computed with a discounted cash flow valuation, with the value of an asset being the present value of expected future cash flows on that asset, i.e., the Weighted Average Cost of Capital (WACC)-, Dividend Discount Model (DDM)-, Flow-to-Equity (FTE)-, and Adjusted Present Value (APV) method. The relative valuation method estimates the value of an asset by investigating how the market prices "comparable" assets relative to variables such as earnings, sales, cashflows or book value. The third and last valuation method uses option pricing models to compute the value of assets that share option characteristics (Damodaran, 2012). These valuation methods will be elaborated on further in the following chapters.

3.1 DCF Valuation

The DCF valuation method is often referred to as the most used valuation method in the world, and one could argue that this approach lays the foundation for all other valuation methods. This is due to that one has to analyze and understand the fundamentals to conduct a relative valuation of an asset. I addition, one might have to do a cash flow analysis before conducting a valuation using option pricing (Damodaran, 2012). However, recent studies show that DCF is the second most widely used approach to valuation by analysts, and that nearly 20% of their reports use DCF as the dominant model (Brown et al., 2015 in Huang et al., 2021) & (Mauboussin & Callahan, 2021). When using the DCF approach to conduct a fundamental valuation of a company, the objective of the analysis is to estimate the intrinsic value of an asset based on its underlying fundamentals, i.e., cash flows and expected growth and risk (Damodaran, 2012).

The DCF method links the value you would attach to an asset based on the present value of its estimated future cash flows, adjusted for their associated risk. Hence, assets yielding high and stable cash flows are more valuable than those generating low and volatile cash flows. To lay the foundation of DCF, let's consider the equation below. This formula represents the value of an asset as the cumulative sum of expected cashflows (CF) over its horizon (n), divided by a discount rate reflecting the riskiness of the estimated cashflows (r) raised to the power equivalent to the time duration (t), as proposed by Damodaran (2012).

$$Value = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$$

The DCF model, while effective in many scenarios, has limitations in certain circumstances according to Damodaran (2012). Damodaran (2012) suggests that in the case of distressed firms with negative earnings and cashflows, the DCF model could provide a negative equity value even if this is only a temporary setback for the firm. Making assumptions about potential cash flows that may never occur, particularly when there's a threat of bankruptcy, complicates the task of estimating future financial outcomes. It may also inadequately estimate the value of firms in cyclical industries, especially during recessions, due to that no analyst can reliably predict when macroeconomic aspects of any given region will change. Furthermore, the DCF model might undervalue firms with unutilized assets or intellectual property rights since the underlying fundamentals of an asset in operation is its basis. If a company is undergoing restructuring or acquisitions, it may pose challenges for DCF valuation due to the resultant changes in investment and financing policies that affect their risk profiles. In addition, the life cycle stage of a firm is an important factor (ibid). Lastly, Damodaran (2012) suggests that depending on whether the firm is in the early stage, maturity, or stability phase, different growth models should be applied.

3.1.1 Flow-to-Equity Method (FTE)

The FTE method values a firm by discounting the cash flow available to its equity holders at the firm's cost of equity. This available cash flow, referred to as free cash flow to equity (FCFE), represents the remaining funds after accounting for net capital expenditures, changes in working capital and net changes in debt on equity investors (ibid). The cost of equity represents the return that equity investors require from the firm, and the equation of the value

of equity is illustrated below. As outlined by Berk & DeMarzo (2014), the FCFE can be calculated directly from the Free Cash Flow to the Firm (FCFF) by subtracting the after-tax interest and adding net borrowing.

$$Value\ of\ Equity = \sum_{t=1}^{t=n} \frac{CF\ to\ Equity_t}{(1+k_e)^t}$$

One limitation of the FTE method is that it assumes constant debt levels. In addition, establishing the debt capacity is necessary for calculating interest rates and net borrowing. Hence, the WACC method is often preferred for its simplicity. However, Berk & DeMarzo (2014) argues that the FTE approach can provide an advantage when analyzing firms with complex capital structures, and that this method is more transparent when estimating benefits to its shareholders.

3.1.2 Weighted Average Cost of Capital Method (WACC)

The WACC method offers a straightforward approach for computing the cost of capital in valuation. This model estimates the free cash flow available to the firm, discounted by the WACC. In the following equation, the free cash flow represents the after-tax earnings before interest and tax, inclusive of depreciation and deducting changes in net working capital and capital expenditures. The WACC embodies the after-tax cost of capital, accounting for the cost of the firm's different financing components, each weighted by their respective market value proportions (ibid).

$$Value\ of\ Firm = \sum_{t=1}^{t=n} \frac{CF\ to\ Firm_t}{(1+WACC)^t}$$

The advantages of the WACC method include its ability to incorporate tax shields benefits and applicability in situations where a firm's leverage is expected to fluctuate over time (ibid) & (Damodaran, 2005). However, the WACC model's simplicity is outweighed by certain challenges. Despite its intuitive appeal, the model's reliance on the free cash flow to the firm (FCFF) can overlook firms experiencing distress. Additionally, the WACC method assumes stable debt levels over the valuation period, which might not reflect the reality for all firms (ibid). Thus, this approach is most suitable for companies maintaining stable debt-to-value

ratios. Furthermore, this method may not accurately reflect the challenges faced by highly leveraged firms since their free cash flow, by definition, do not incorporate debt repayments (Damodaran, 2012). Hence, while the WACC method offers intuitive and simple model for financial valuation, it requires consideration of the underlying assumptions to increase reliability.

3.1.3 Divididend Discount Model (DDM)

The DDM serves as an elemental tool in equity valuation. This model is recognized for its simplicity, with the core premise suggesting that a firm's equity value is the present value of its expected future dividends (Damodaran, 2006). The model relies on the following equation, where the Dividend per Share (DPS) during a given period (t) and the firm's required return on equity (K_e) are primary variables. However, it is crucial to understand that the DDM's simplicity is accompanied by assumptions that may not reflect reality. It assumes a perpetual, constant growth in dividends, which could lead to highly sensitive results influenced by the inputs of the growth rate and firm returns (ibid).

$$Value\ per\ share\ of\ stock = \sum_{t=1}^{t=\infty} \frac{E(DPS)_t)}{(1+k_e)^t}$$

Though DDM is the simplest valuation model, it also tends to be the least precise. Its accuracy is limited by numerous factors such as growth prospects, profitability, legislative changes, as well as general economic outlooks and the competitive landscape, all of which make it challenging to predict future dividends accurately (Berk & DeMarzo, 2014). Furthermore, the model can lead to skewed valuations if the firm pays out fewer dividends than its affordability (Damodaran, 2012). It also overlooks other means of returning cash to shareholders beyond dividends (Damodaran, 2007). Hence, the model is not sufficient for in-depth analysis on its own due to the underlying assumptions and limitations.

3.1.4 Adjusted Present Value Method (APV)

The APV method is an alternative approach to the WACC and FTE methods in valuation. This approach initially evaluates a firm's unlevered value by discounting the firm's FCFF (adjusted for growth) with the unlevered cost of capital. This discount rate does not account for the tax

shield. The value of an unlevered firm is given by the following equation, provided by Berk & DeMarzo (2014).

$$Value\ of\ Unlevered\ Firm = \frac{FCFF_0(1+g)}{p_u - g}$$

The unlevered asset beta can be used to compute the unlevered cost of capital by implementing the capital asset pricing model (CAPM). This unlevered asset beta can be calculated by the following equation.

$$\beta_{unlevered} = \frac{\beta_{current}}{1 + (1-t)\frac{D}{E}}$$

Subsequently, the value of expected tax shield benefits, equivalent to the product of interest paid, the cost of debt, and the corporate tax rate, is added. These benefits are discounted by the cost of debt, symbolizing the risk associated with these cash flows, which is illustrated in the following equation. This approach assumes predetermined debt levels for the calculation of the interest tax shield (ibid).

$$Value\ of\ Tax\ Benefit = \frac{(Tax\ Rate)(Cost\ of\ Debt)(Debt)}{Cost\ of\ Debt} = (Tax\ Rate)(Debt)$$
$$= \tau_c D$$

Following this, the method incorporates an estimation of the firm's default risk and expected bankruptcy costs corresponding to the level of debt, which involves multiplying the probability of bankruptcy with the direct and indirect costs of bankruptcy. The tax rate applied in these computations represents the firm's marginal tax rate, which is assumed to remain constant over time. The final levered value for a company is illustrated in the following equation. It should be noted that the estimation of these components poses significant challenges due to the difficulty in directly estimating the bankruptcy probability and cost.

$$V_L = V_U + PV(Tax\ Shields) - PV(Bankruptcy\ Costs)$$

Unlike other approaches, APV provides an explicit valuation of the tax shield and potential bankruptcy costs, making it advantageous for firms with volatile debt-equity ratios (ibid). In addition, the APV method offers the flexibility to accommodate different leverage policies over time and allows for the use of different discount rates for each debt component (ibid) &

(Damodaran, 2012). However, it introduces a circularity problem, as the level of debt must be known to compute the interest tax shield, but the value must be known to compute the debt level with a constant debt-equity ratio.

3.2 Relative Valuation

Relative valuation is a method that values a firm based on the market pricing of its comparable peers. This approach typically involves comparison using common variables such as revenues, earnings, cash flows, or book value. It is based on the fundamental presumption that the market, on average, accurately prices firms within the same industry, allowing for identification of individual stocks that may be under- or overvalued (Damodaran, 2012).

Several multiples are often utilized in this valuation method. Mauboussin & Callahan (2021) suggest that market multiples are "by far" the most popular approach to valuation, with 88% of the analysts in the survey saying that they used the price-earnings (P/E) ratio when valuing companies. This ratio presumes comparability and accurate market pricing of firms within the same industry. Price-book (P/B) value ratio and price-sales (P/S) ratio are also extensively used in valuation. Firms with lower multiples relative to their peers are generally deemed undervalued, resulting in a potentially more attractive investment.

Enterprise value (EV)-based multiples, such as EV to FCF, EBITDA, and EBIT, are another dimension of relative valuation. According to Mauboussin & Callahan (2021), 77% of analysts use the EV/EBITDA multiple when they conduct a valuation of a company. As EV represents the total value of the firm's underlying operations, these multiples are more appropriate when comparing firms with different leverage ratios. It is noted that firms with high growth rates and low capital requirements tend to exhibit higher EV/EBITDA multiples (Berk & DeMarzo, 2014).

In contrast to DCF valuation, which seeks to estimate a firm's intrinsic value, relative valuation leans more on the market's accuracy. It is suggested that market prices of stocks are generally priced correctly, with errors in individual stock pricing expected to correct over time. In a correctly priced market, analysts can efficiently derive firm value estimates from actual prices of comparable firms, avoiding the potential uncertainty of future cash flow forecasts. Damodaran (2012) suggests that relative valuation is more likely to reflect the market sentiment than DCF valuation. In addition, while relative valuation is much less time

consuming and has fewer underlying assumptions than the DCF approach, the simplicity of the multiples approach constitutes its main advantage (ibid).

Relative valuation has its share of challenges, even though it is the most used valuation method among analysts. It pivots on the underlying assumption that comparable firms exist, but it is crucial to note that each firm carries a unique risk and growth profile. This can sometimes give rise to a misuse or manipulation of multiples, largely due to the subjective, and potentially biased, selection of comparable firms (Berk & DeMarzo, 2014). As the value derived from relative valuation reflects the market sentiments associated with the chosen peers, optimistic or pessimistic market expectations can distort the final valuation, leading to potential over- or underestimations (Damodaran, 2012). Moreover, the approach estimates the value of a firm solely on its peers, and thus potentially bypassing an evaluation of the collective industry's outlook and value. This aspect can lead to more pronounced issues during periods of positive or negative short-term trends in an industry, where widespread over- or undervaluation may be overlooked (Berk & DeMarzo, 2014).

3.3 Contingent Claim Valuation

The contingent claim valuation model represents an alternative approach to traditional DCF models and is particularly suited for valuing assets with option-like characteristics, such as patents, licenses, and reserves. This model acknowledges that these assets' expected value may be different from the present value of expected cash flows, especially when those cash flows are contingent upon specific events (Damodaran, 2012). As such, the real options model can potentially offer a more accurate valuation of contingent assets compared to DCF models, since one could potentially value assets that one otherwise would not be able to value. In addition, option pricing models provide us insight in the factors that drive value. The contingent claim method displays that for assets with option-like characteristics, increased risk or variability can increase, rather than decrease, their value (Damodaran, 2017).

The model's effectiveness is contingent upon a few restrictive assumptions, notably, the constant variance and dividend yield. These assumptions may have minor effects for short-term options but may lead to considerable estimation errors for longer-term options or non-traded assets. In addition, many of the inputs for the model are difficult to obtain, i.e., the value of non-traded assets cannot be reliably obtained from the market and thus estimating its current value or variance may be a formidable task. Last, an analyst risks double-counting assets if

one, for instance, assumes a higher growth rate in a discounted cash flow valuation for a company due to its contingent assets and then separately value these assets as options and adding this value to the original estimation (ibid). Hence, while the contingent claim valuation model presents an innovative perspective in asset valuation, its practical application could be limited.

3.4 Selection

After examining the mechanisms of the OFSE industry as well as the various valuation methodologies and their applications, I now aim to determine the most appropriate approach for valuing NOV. The evaluation of the most appropriate valuation approach for NOV is based on several factors, including available information, firm- and industry-specific factors, reliability, and the life cycle of the firm.

Given the availability of NOV's audited annual and quarterly reports, and the fact that there are large amounts of publicly available data sources of information regarding the company and the industry, I have the sufficient financial information to conduct a DCF- analysis. Hence, a fundamental valuation is suitable for the company. As a market leader and long-standing provider of solutions to upstream oil and gas companies, and with recent focus into the renewable energy segment, NOV's growth prospects could vary across these markets, potentially influencing its economic outlook. While market sentiment may not currently reflect the firm's underlying fundamentals due to the recent boom, peer companies sharing a similar risk-profile could provide a more accurate reflection of NOV's future growth prospects (Berk & DeMarzo, 2014). They suggest that relative valuation is a more simplified alternative to the DCF approach. However, they emphasize that a DCF-analysis provides the advantage of implementing unique firm-specific data, which can potentially yield a more precise estimation compared to relative valuation (ibid).

When determining which DCF method to utilize, I examine each approach's characteristics in section 3.1. Now, each method's characteristics against NOV's capital structure must be assessed. Given NOV's relatively stable equity ratio over recent years, the APV approach seems unsuitable. The FTE and WACC methods emerge as the most relevant approaches. Koller et al. (2020) argues that the WACC method is the most appropriate method when a firm has proved a stable equity ratio. In addition, considering the ease in determining the value of the firm's capital structure and the interest tax shield, FTE may not be an optimal choice for

NOV (Berk & DeMarzo, 2014). Furthermore, Damodaran's *Big-picture valuation spreadsheets* indicates that the WACC approach is more fitting when valuing a company such as NOV (Damodaran, 2023). Hence, I have decided to conduct a fundamental valuation of NOV using the WACC model.

In a DCF-analysis, a crucial factor to consider is the firm's phase in life cycle. NOV witnessed declining revenues between 2014 and 2019. Since then, the estimated revenue growth for 2022 stands at 17%, though this high growth rate is anticipated to decelerate over the next five year, due to changing economic conditions. For instance, the Russia-Ukraine conflict and the lasting implications of the COVID-19 pandemic, are assumed to contribute to a reversal in this rapid growth. While the growing public concern about the energy transition and climate change expected in the coming years could promote growth for NOV, it is crucial to consider the sector's competitive landscape and geopolitical risks, and thus the underlying uncertainty in the estimates (DNV, 2023). At horizon, the firm is assumed to look like a mature firm and grow in alignment with the entire economy, which should reflect the long-term nominal interest rate (Damodaran, 2012).

Even though relative valuation was initially perceived as a more simplified alternative to a DCF-analysis, it could complement the fundamental valuation by offering a comparative market perspective. Companies that share a similar exposure to market risk could serve as appropriate peers for NOV, allowing us to compare the estimates from the fundamental valuation with market prices. NOV has certain assets, including patents, licenses, and reserves, that share similarities to real options. However, I choose not to include the contingent claim approach in this thesis as the expected value of these assets can be incorporated within a DCF-analysis.

In conclusion, a fundamental valuation of NOV will be conducted using the WACC approach, complemented by a relative valuation to support the findings.

4. Macroeconomic Analysis

I have described the mechanisms of the OFSE industry and energy markets, as well as a theory section of valuation approaches and supporting literature. It has been determined that the WACC method is the most appropriate valuation method for this analysis, supported by relative valuation and sensitivities. In this section, I will provide a macroeconomic analysis of NOV, and discuss the macroeconomic factors affecting the OFSE industry. For NOV, this would involve analyzing factors such as oil and gas prices, supply and demand, global trade patterns, government regulations, and political tensions. The framework that will be used to conduct the macroeconomic analysis of NOV is a PESTEL analysis. The PESTEL framework was first mentioned by Harvard Professor Joseph Aguilar in 1967 and was modified in the 1980s to what is today (Richardson, 2006 in Yüksel, 2012). PESTEL is an acronym for each of the different macro environments surrounding a company or industry that the analysis examines (Political, Economic, Socio-cultural, Technological, Environmental, and Legal).

4.1 Political Aspects

In recent years, political tensions have significantly impacted the OFSE industry, causing disruptions and volatility in global oil and gas supply and demand. In 2019, the attack on Saudi Aramco led to a massive reduction in oil supply and increased geopolitical risk. This caused an immediate spike in oil prices and exposed the vulnerability of critical infrastructure to such attacks. As illustrated in figure 20, the attack led to the worst disruption to world supplies on record at the time (ABC, 2019). Additionally, Russia's invasion of Ukraine triggered international sanctions that restricted Russian oil and gas exports, resulting in supply shortages, and increased global oil and gas prices. These sanctions, including termination of Russian energy exports that previously covered 40% of European gas consumption, have led to significant short-term benefits for energy efficiency and the LNG trade. While also accelerating the European energy transition in the long run due to higher gas prices and increased policy support for renewable energy, this shift will probably have lasting global implications even after the resolution of the current conflict (DNV, 2023).

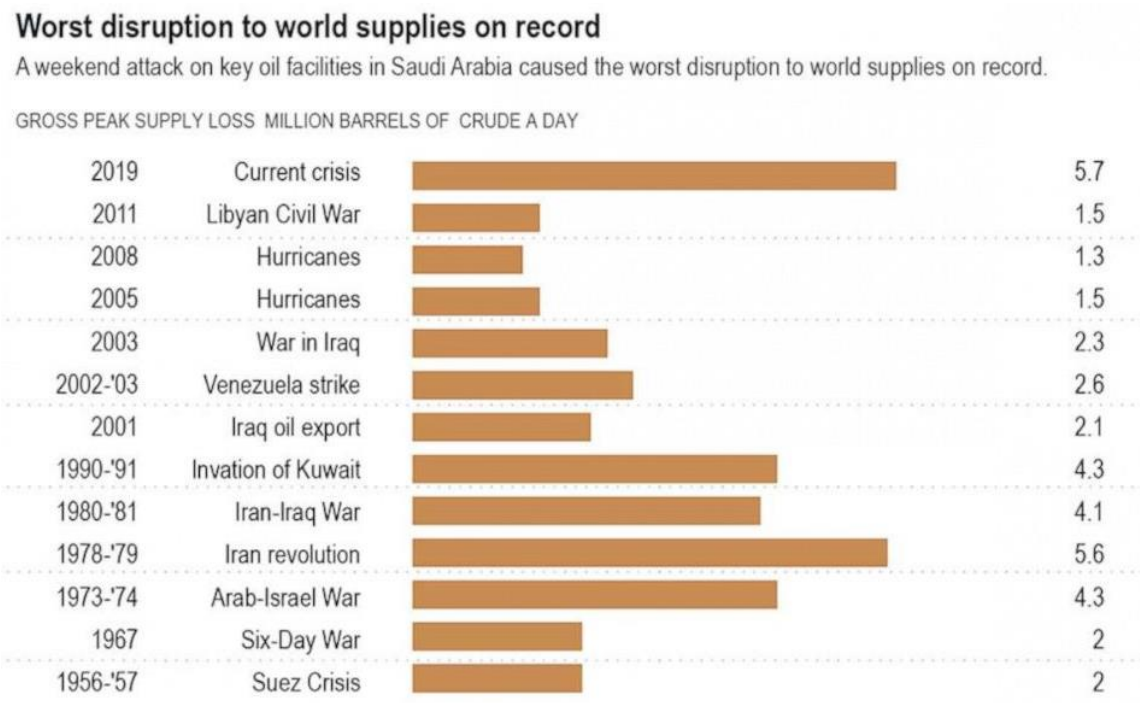

Figure 20: The figure illustrates key geopolitical events and how these events impacted the world supplies, measured by gross peak supply/loss in millions of barrels of crude oil a day.
Source: (ABC, 2019)

These events have had severe effects on the OFSE industry and to minimize risk, the companies' need to adapt and diversify their supply sources has increased (Ati et al., 2021). Furthermore, the trade war between the United States and China that began in 2018, has also affected the OFSE industry by creating uncertainties in trade and investment, and by reducing demand for oil and other energy products (Handley & Limão, 2022). The effect on trade policy uncertainty is illustrated in figure 21 (ibid).

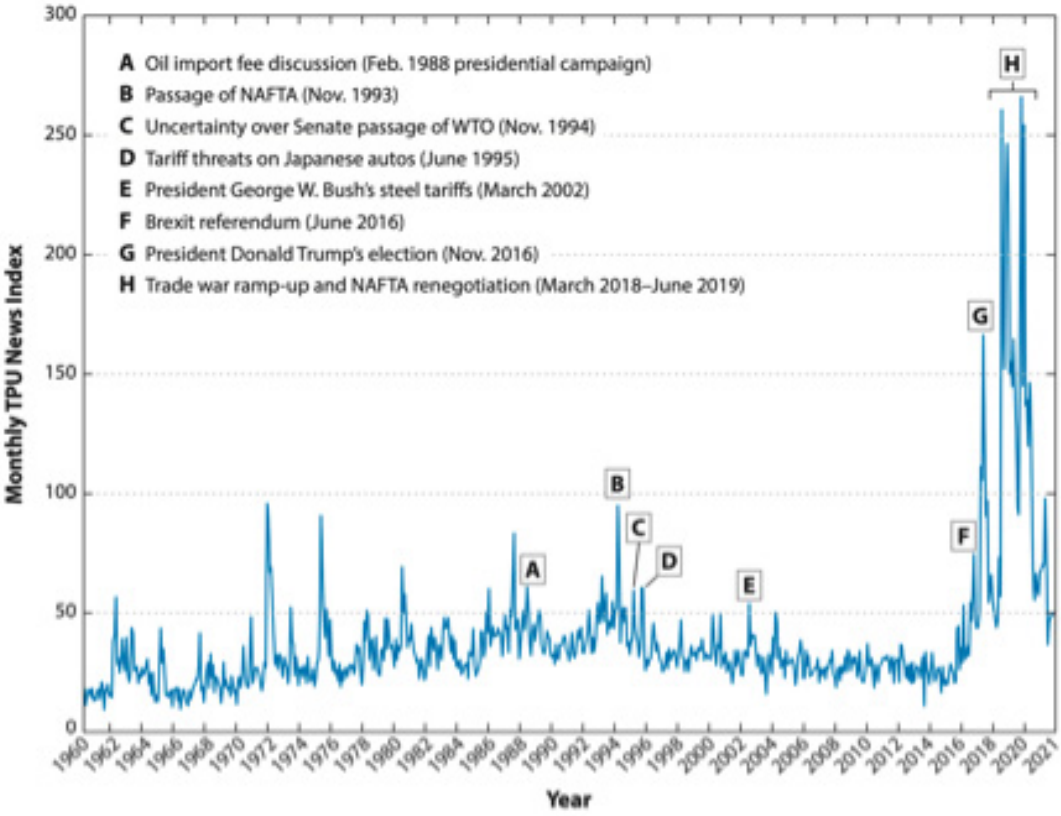

Figure 21: This figure illustrates the relationship between eight different events and the monthly trade policy uncertainty index (TPU Index). Source: (Handley & Limão, 2022)

Key drivers for oil and gas investments, such as M&A, include the need for reserve replacement, the chase after cost-effectiveness, investor pressure, recent challenging market conditions such as fluctuating oil prices and geopolitical events, as well as the strategic use of acquisitions to support growth and changes in portfolio investment cycles (IHS Markit Transaction Analysis, 2019 in Özgür & Wirl, 2020). Over the past twenty years, domestic M&A transactions accounted for 64%, comprising of 11,675 deals with an average deal value of $373 million. The majority of these transactions that involved upstream activities, more than 90%, took place in U.S., Australia, Canada, United Kingdom, Russia, and China. Figure 22 shows oil and gas M&A transactions from 2000 to 2018 and major geopolitical events (Özgür & Wirl, 2020). As the volatility in oil and gas prices impacts oil and gas investments, one could also assume that geopolitical events would affect investment decisions. As illustrated in the figure, events such as OPEC cuts and U.S. shale increase, as well as the financial crisis, seemed to have an impact on M&A investments.

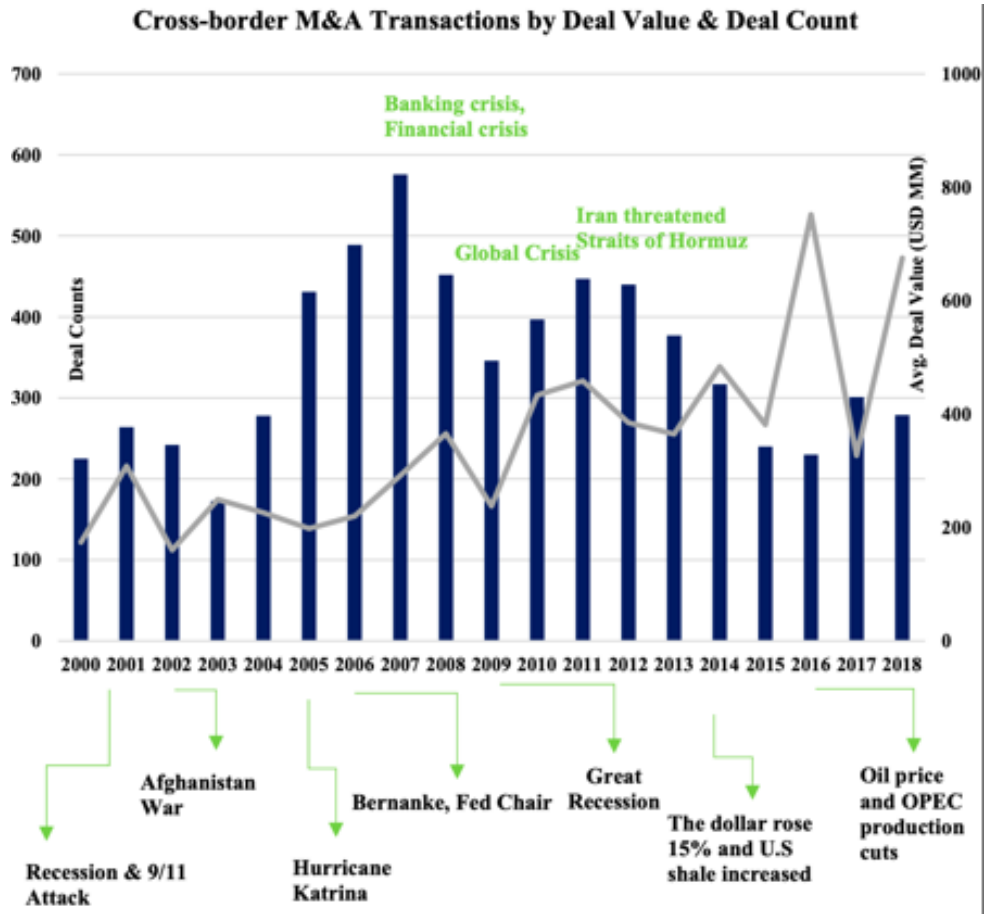

Figure 22: Illustrates the geopolitical and economic events between 2000 and 2018, as well as cross-border oil and gas M&A transactions. Source: (Özgür & Wirl, 2020).

The OFSE industry is highly regulated on a national, as well as a global basis. There are several trade agreements, tariffs, as well as import and export regulations that affect this industry. The most relevant and notable examples are the Paris Agreement, Kyoto Protocol, Directive 94/22/EC of the European Parliament and of the Council, energy policies of IEA countries, tariffs, and subsidies. Globally, the United Nations Framework Convention on Climate Change (UNFCCC), established in 1992, oversees and approves international agreements related to energy use. The Paris Agreement, entered into force in 2016 and aimed at enhancing the global response to climate change threats. Furthermore, the 1997/2005 Kyoto Protocol, which outlines binding emission reduction targets, is linked to the UNFCCC. In Europe, the

European Parliament, and Council's Directive 94/22/EC, dated May 30, 1994, outlines the terms for obtaining and utilizing permits for hydrocarbon prospecting, exploration, and production.

As political risk can reduce investment in regions where political tensions or instability occurs, it is also possible that governmental bodies can pass laws or acts, such as subsidies, to stimulate the energy transition towards cleaner and alternative energy sources, such as both onshore and offshore wind, as well as nuclear and solar power. According to a policy report by IEA, in 2022, global subsidies for fossil fuel usage is estimated to increase to over USD 1 trillion (IEA, 2023). This is by far the largest annual value ever seen, as illustrated in figure 23. Oil subsidies increased by approximately 85%, while gas subsidies more than doubled compared to 2021.

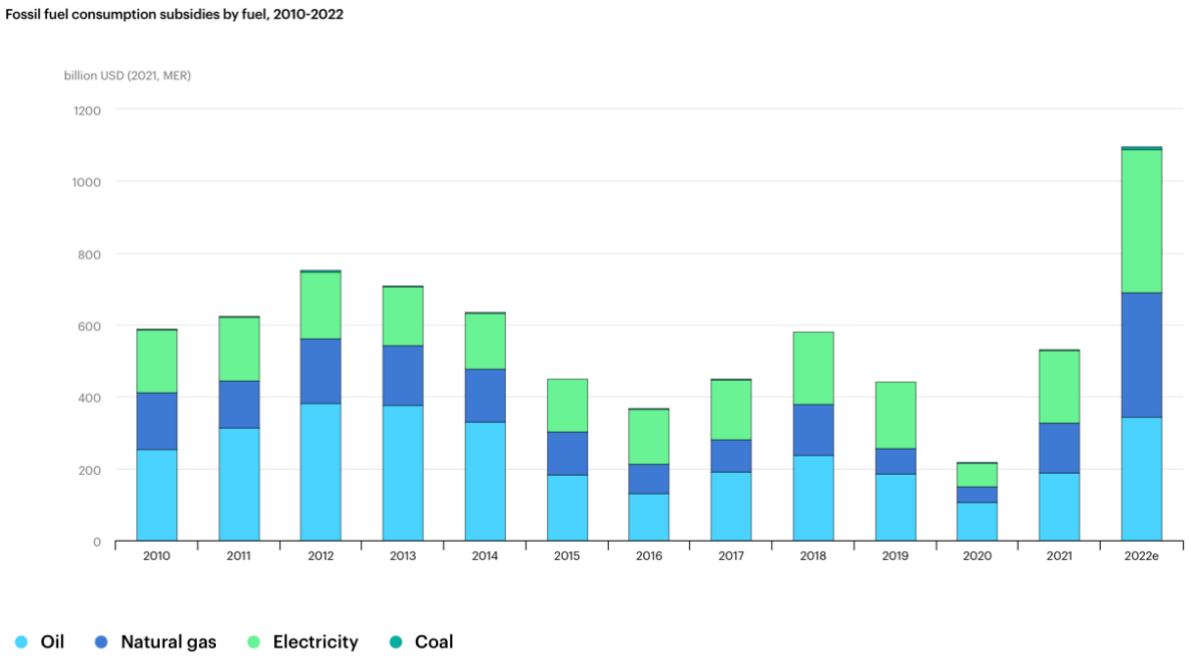

Figure 23: This figure illustrates fossil fuel consumption subsidies by fuel between 2010-2022. The subsidies increased substantially due to the COVID-19 pandemic.
Source: (IEA, 2023)

The same report identified over $500 billion in subsidiaries to lower energy costs in 2022. This extra spending was primarily in developed nations, with approximately $350 billion allocated to Europe, as illustrated in figure 24 (ibid). Only $114 billion of this extra spending were in emerging markets and developing countries. Some of this spending can be defended

as social or political necessities, and average end-user prices in Europe were close the market reference values in some cases. However, given the energy transition and common goals to reduce carbon emissions, as well as the Glasgow Climate Pact to phase-out inefficient fossil fuel subsidies, these subsidiaries worked in the opposite direction by favoring the incumbent fuel. In addition, it risks the motivation for energy-efficient practices, and the adoption of greener and cleaner fuel alternatives (ibid).

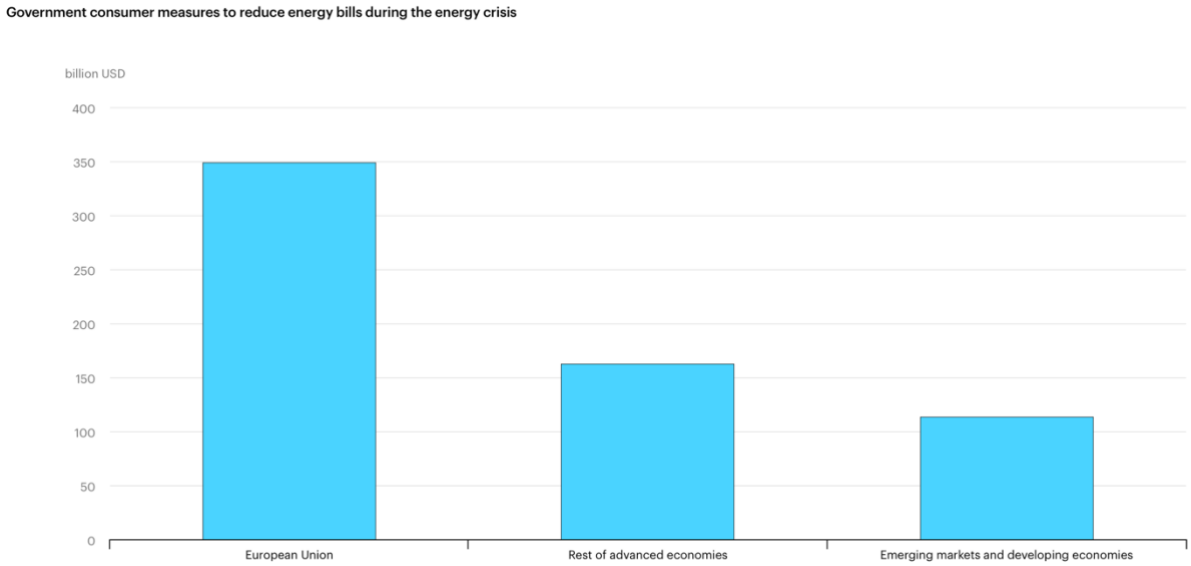

Figure 24: This figure shows the government consumer measures to reduce energy bills during the energy crisis in 2022 by region.
Source: (ibid)

4.2 Economic Aspects

On the one hand, factors that drive the OFSE industry are natural resources such as oil and gas reserves, policies, institutions, and regulations. On the other hand, factors such as commodity fluctuations, including oil and gas price volatility, and economic development have great impact on the industry fundamentals. For instance, the value oil and gas reserve equivalents will increase if the oil and gas prices increase. Hence, one would assume that investment activity and value in the sector will increase because of higher oil and gas prices. In figure 25, we can observe a positive relationship between both oil and gas prices and cross-border M&A deal counts (Özgür & Wirl, 2020). High oil and gas prices will encourage oil and gas exploration and production activities, and thus benefiting companies such as NOV and other

OFSE firms. However, prolonged periods of low prices can lead to reduced investment in the sector, affecting the demand for NOV's services and solutions.

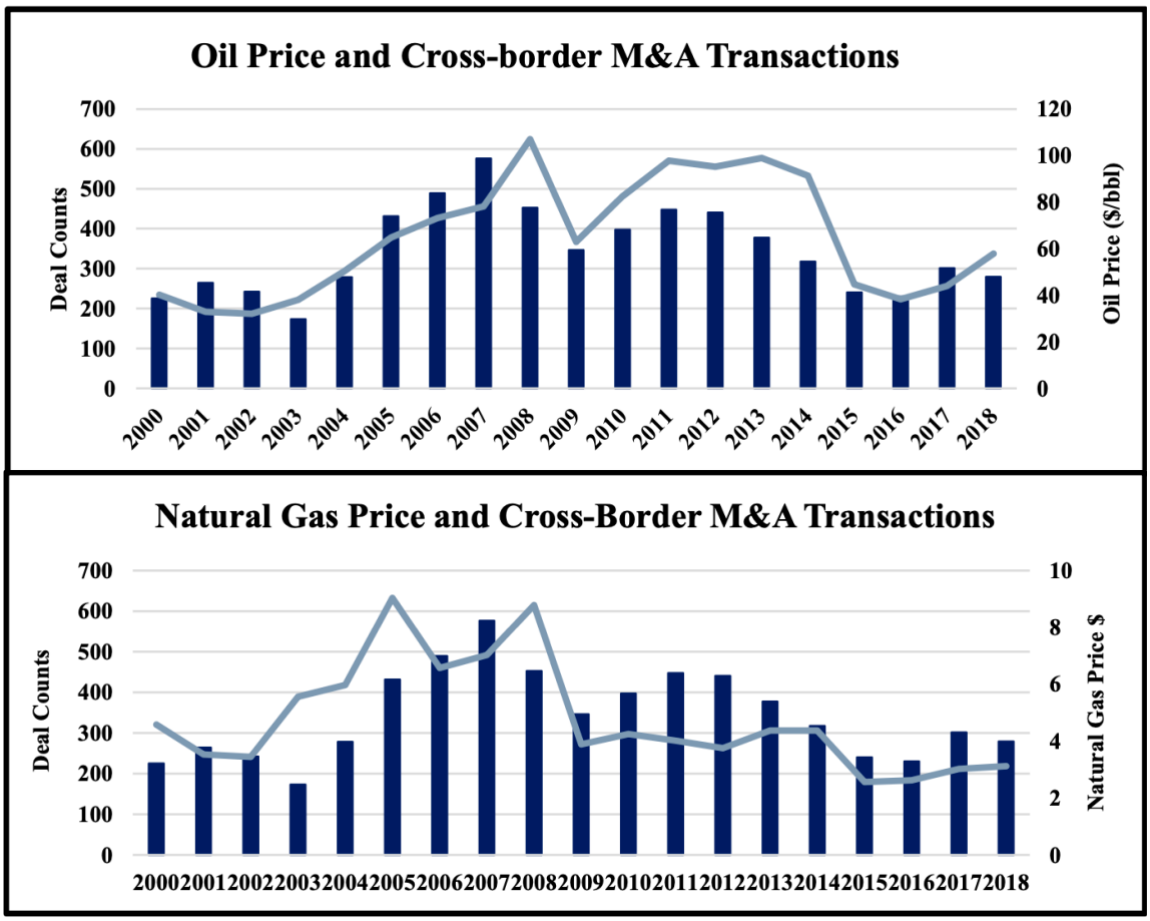

Figure 25: The figure illustrates the relationship between oil and gas prices and cross-border M&A transactions by deal count in period between 2000 and 2018.
Source: (Özgür & Wirl, 2020).

Economic growth and development in both developed and emerging markets directly impact the demand for oil and gas, which in turn affects the OFSE industry. According to the International Monetary Fund (IMF), the global economy is projected to grow by 2,9%, while the Asia-Pacific region is expected to grow by 4,7% (IMF, 2022). Strong economic growth will drive energy demand, and thus creating opportunities for oil and gas companies, while economic downturns or recessions reduce energy consumption and set back the firms' growth prospects. The global economic outlook has worsened and pushed the oil and gas prices lower. Since the U.S. shale revolution that escalated oil and gas investments, the oil and gas investments as a share of world GDP declined to 0.5 (1,5% of total GDP) in 2019 after it

peaked at 0.9 (3,6% of total GDP) in 2014 (IMF, 2022). As figure 26 shows, the investments as a share of world GDP decreased further during the pandemic. The cyclical downturn had an asymmetric impact on publicly traded firms, which reduced oil and gas investments more significantly than national oil companies. This trend aligns with larger declines in investment in America and Africa, compared to Russia and the Middle East. It is also influenced by the fact that national oil companies' investment decisions are more frequently influenced by a wider range of factors. As such, these companies tend to be less responsive than publicly traded firms (ibid).

Oil and Gas Investment as Share of World GDP

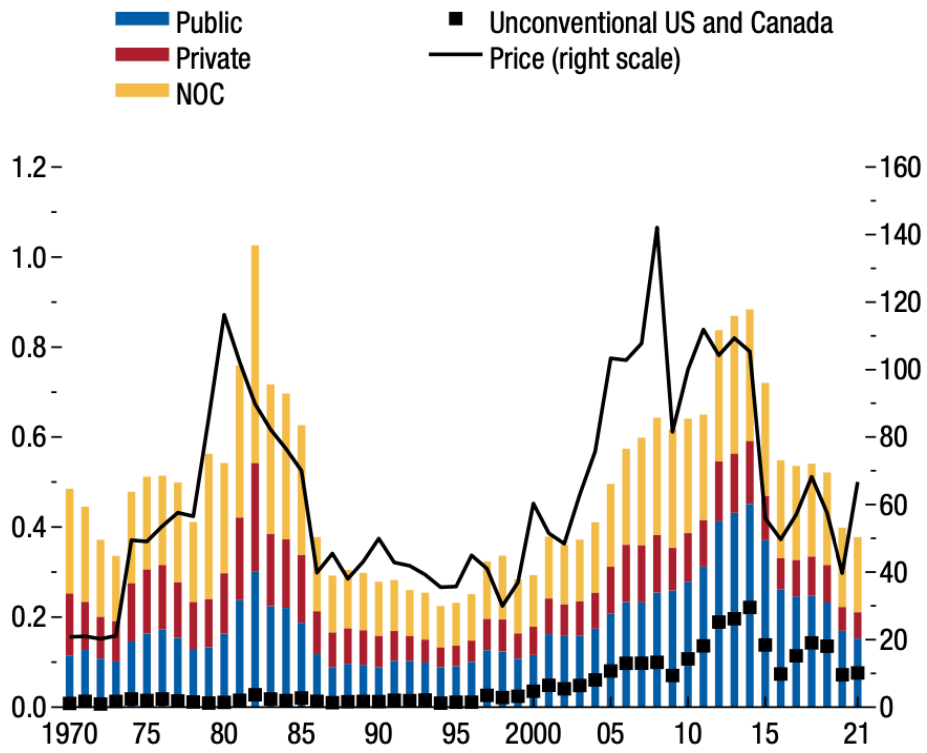

Figure 26: The price of oil and gas in this figure is calculated as a weighted average of the West Texas Intermediate crude oil and Henry Hub natural gas prices, with the weights corresponding to global oil and gas production. The resulting figure is then divided by the U.S. GDP deflator to adjust for inflation. Note that NOC stands for National Oil Company.
Source: (ibid)

The global economic outlook has weakened amid high inflation and interest rates. The current inflationary situation is closely associated with pandemic-related stimulus packages implemented by governments and is further affected by the ongoing Russia-Ukraine war.

Norway’s stimulus package serves as an example, given that its oil and gas sector directly accounts for 17% of the country's GDP. These stimulus packages have contributed to near-record low unemployment rates in several OECD countries and favored fossil industries which led to higher oil and gas activity. In addition, it is observed large shifts in consumer spending patterns resulting from lockdowns, as well as supply chain disruptions due to the pandemic (DNV, 2023). As interest rates are expected to increase more than previously assumed, the projections for the global economy have worsened (IMF, 2022). However, worldwide oil demand increased by 1,3 million barrels per day earlier this year, resulting in a new high, according to data from Joint Organization’s Data Initiative JODI (JODI, 2023). This new high was driven by growing usage in Japan, Indonesia, and South Korea. Simultaneously, due to large reductions in global oil production, particularly in the U.S. and UK, global oil production reached a five-month low and decreased by more than 270 000 barrels per day (ibid).

As NOV operates in many locations across the world, their revenues, assets, and liabilities are exposed to foreign exchange rate fluctuations. To mitigate this risk, NOV may use foreign currency forward contracts to align the currency of revenues and associated costs. However, the impact on net income is limited, as the majority of these operations use the local currency as their functional currency. Net assets and liabilities not denominated in the functional currency expose the company to exchange rate changes that affect income. In 2021, 2020, and 2019, NOV reported foreign currency losses of $16 million, $2 million, and $36 million, respectively (NOV, 2022). The US Dollar Index, which gauges the greenback’s value against a weighted selection of prominent currencies, was above 105 earlier this year, making oil more expensive for holders of other currencies (MarketWatch, 2023).

4.3 Socio-Cultural Aspects

The oil and gas industry is evolving through an enormous change as it moves forward in the energy transition and towards the goal of net zero by 2050. In addition, the industry needs to reduce greenhouse gas emissions to at least 45% below 2010 levels by 2030 to achieve the targets in the Paris Agreement (UN, 2020). The increasing interest and awareness on the subject combined with increasing climate policies have probably brought the industry’s negative image back to life as a huge polluter of greenhouse gases (IMF, 2022). As many companies in this industry promote their move towards more sustainable solutions, using greener and renewable energy, this image is being exploited. According to IMF, the energy

companies show little ability to diversify into renewable energy and derive most of their revenue from the upstream oil and gas sector (ibid). However, as figure 27 illustrates, both the awareness on the matter and sustainable investments have increased sharply since the Paris Agreement (ibid).

Climate Policy and Energy Transition Indicators

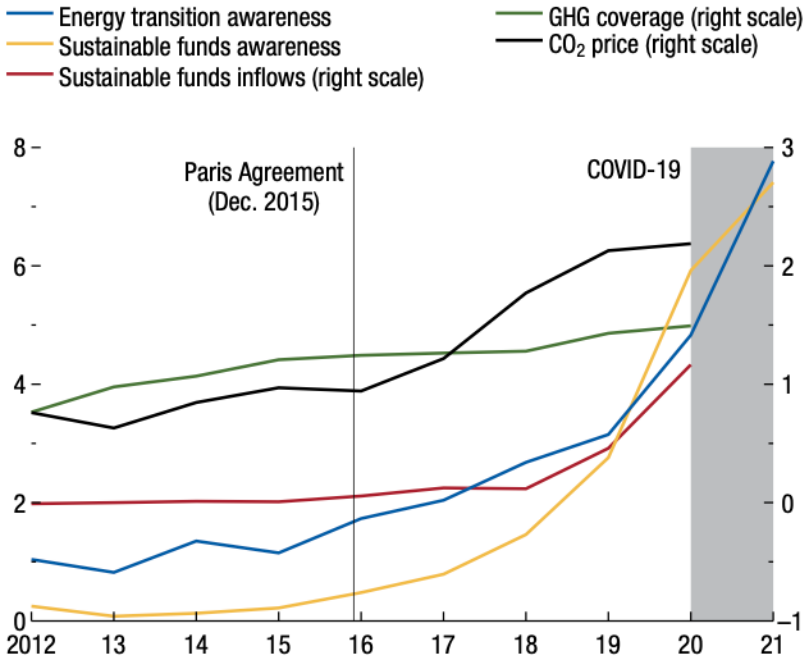

Figure 27: This figure illustrates the relationship between climate policy and energy transition indicators. Note that to adjust the scale, the values of the proxies for energy transition, sustainable funds, and GHG (Greenhouse Gas) coverage (expressed in percentages) have been divided by 10. The cost of CO2 is articulated in terms of dollars per ton. Additionally, inflows into sustainable funds are depicted as a portion of global gross fixed capital formation and presented in percentage terms.
Source: (ibid)

Cultural trends, as well as customer buying trends have changed enormously and are being affected as they push towards sustainable and renewable energy solutions, e.g., solar and wind. The growing public concern about the energy transition and climate change has led to increased scrutiny of the oil and gas industry. Companies like NOV need to adapt to this shift in societal values by adopting sustainable operations and diversifying into renewable energy solutions, thus reducing their environmental impact. However, despite the increasing number of alternative energy solutions and technologies, oil and gas production and exploration have

played a critical role in regions and economies that are dependent on revenues from oil and gas operations.

The oil and gas industry can have significant social impacts on societies and communities living in oil-rich areas. Particularly, potential negative effects on health and well-being stem from oil and gas extraction. According to Nkem et al., oil and gas operations in oil-rich regions in Africa have several negative aspects such as social exclusion that concerns limited compensation for environmental damage, high unemployment, and poverty rates, as well as unequal political representation. In addition, the study found that social impacts involved insufficient government or oil-industry investment in social infrastructure and health concerns linked to pollution, homelessness, and lack of social cohesion (Nkem et al., 2022). Loss of livelihoods resulting in limited opportunities for residents, such as poverty and ability to educate their children. Oil spills can reduce household food security by as much as 60% and decrease the nutritional value of food such as vegetables, which in turn could lead to a 24% increase in childhood malnutrition (ibid). Research also associates such pollution with numerous infant deaths annually and increased risk of serious health conditions, such as kidney damage and cancer among others (ibid).

Landowners and residents of resource-rich countries and regions often miss out on sharing revenues and benefits from oil and gas extraction, with insufficient compensation or reinvestment in the affected “host” communities (Nkem et al., 2022). Negative effects on the environment and health are widely recognized, such as the oil spills in Nigeria’s Niger Delta Region between 1991 and 2019 (Mafiana et al., 2020). These spills, along with land clearing, gas flaring, and infrastructure development, have made land and waterways unproductive. This has in turn led to further deforestation and forced people to seek alternative income sources. In addition, approximately 64% of the oil-rich Niger Delta Region’s population lack stable income and basic amenities, and NDR’s human development index lags behind countries with similar oil reserves, like Venezuela and Indonesia (Nkem et al., 2022).

4.4 Technological Aspects

The technological aspects of both NOV and the OFSE industry are crucial for maintaining competitive, increase efficiency, and reducing the environmental footprint. Technological innovations and advancements in NOV and the OFSE industry are driving efficiency, safety,

and sustainability. Companies that invest in and adopt such innovative technologies will be better positioned to adapt to changing market conditions and new regulations.

NOV and the OFSE industry are continuously adopting digital technologies and solutions such as artificial intelligence (AI), machine learning, and the Internet of Things (IoT) to optimize operations, improve decision-making, and enhance efficiency. Automation is streamlining processes and reducing human intervention, leading to safer and more cost-effective operations (HMC, 2022). Increased productivity speeds up supply chains, and thus enhancing economic opportunities and competitiveness. Innovations in oil and gas contribute to affordable gas prices, natural gas usage, and improved energy transition strategies. Automation in the oil and gas sector enhances cost efficiency by facilitating better preventative maintenance solutions. For example, NOV provides drilling automation solutions such as Kaizen, as well as systems of intelligent control, advanced material handling, and remote operation. In addition, NOV provides fully automated rigs and delivers process improvements. These automation solutions significantly reduce the likelihood of equipment damage and safety risks for workers. Consequently, this leads to a safer work environment and lower maintenance costs (ibid).

Currently, some of the leading innovations in the oil and gas sector are automation and AI. The use of AI exceptionally enhances operations across upstream, downstream, and midstream activities. Data-driven drilling solutions and technology minimizes errors, saving time and increasing productivity. AI also simplifies the process of obtaining valuable information and data from potentially hazardous locations, which is crucial for minimizing risks to workers and improving safety measures. In addition, AI reduces the probability of data errors, as operations are carried out through a comprehensive system.

According to the Artificial Intelligence Global Executive research project by MIT Sloan in collaboration with BCG, approximately 75% of executives believe that AI will empower their companies to venture into new businesses, and nearly 85% believe AI will help their companies gain or maintain a competitive edge (Ransbotham et al., 2017). However, just about one in five companies has integrated AI into some of their offerings or processes, and one in 20 companies has extensively incorporated AI into their offerings or processes (ibid). A recent EY survey however, showed that the application of AI in the oil and gas industry is already beginning to have an impact. The survey showed that 92% of oil and gas companies have

invested in AI or are planning to invest in the upcoming years, and that 50% of oil and gas executives said that they have already adopted AI in their organizations (EY, 2023).

In the industry, the use of drones for monitoring has been a groundbreaking and innovative technological advancement. Drones provide several benefits, such as improving operational efficiency, increasing safety, and reducing costs. They can access hard-to-reach or hazardous areas, conduct equipment inspections, and monitor pipelines or other infrastructure for potential leaks, damage, or security threats. For instance, they can be used to examine thousands of miles of pipelines at a significantly lower cost compared to helicopter-based inspections (Elsight, 2023). This aerial surveillance allows companies like NOV to address issues proactively, minimize environmental impact, and enhance overall operational efficiency.

As adoption and reliance on digital solutions and artificial intelligence in the industry has increased in recent years, cyberattacks risks have risen. These attacks can potentially disrupt operations, compromise sensitive data, and cause significant financial losses (WEF, 2023). As illustrated in figure 28, exploration has the lowest cyber vulnerability and severity profile due to its closed data acquisition system and simple vendor ecosystem (Deloitte, 2017). However, oil and gas well development is more exposed to cyber incidents due to high drilling activity, extensive infrastructure, and a complex network of engineering firms, suppliers, drillers, and consultants. Oil and gas production operations have the highest cyber vulnerability in upstream operations, primarily because of their legacy asset base, which has been retrofitted and patched over time without a focus on cybersecurity, and the lack of monitoring tools on existing networks. According to a Deloitte study, only 14 percent of companies have fully operational security monitoring centers in place (ibid).

Cyber Vulnerability/Severity Matrix by Upstream Operations

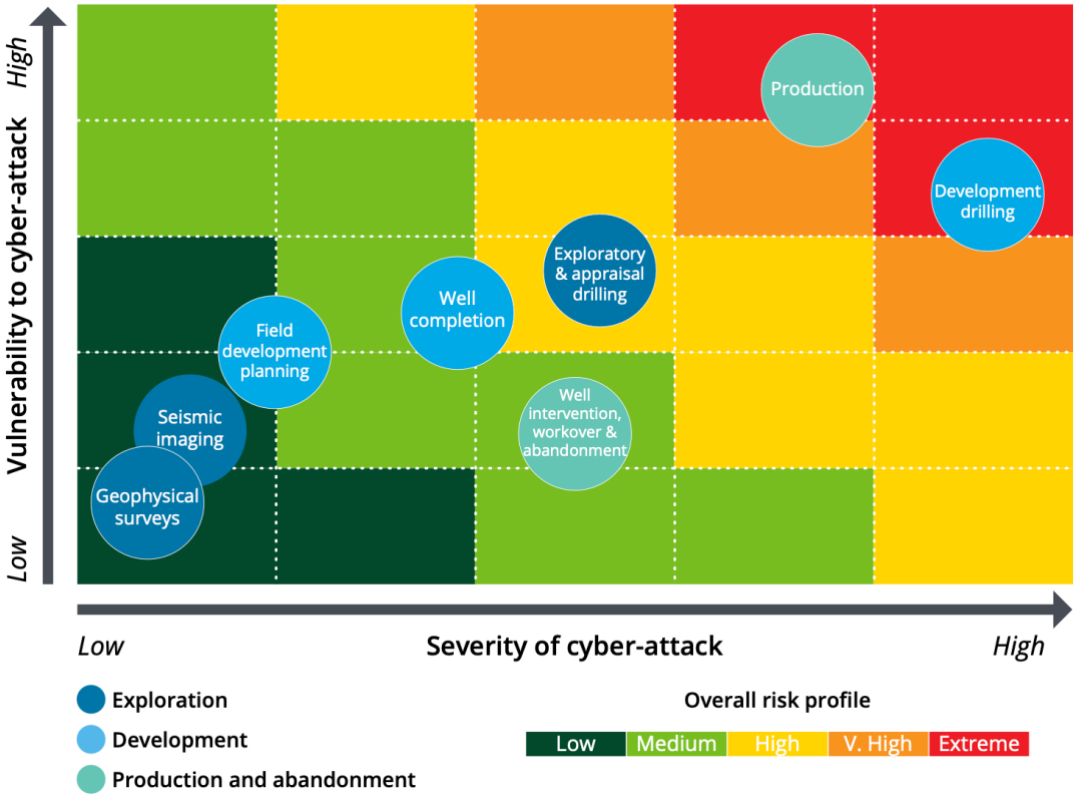

Figure 28: This figure illustrates that the stages in the upstream process, namely exploration, development, production, and abandonment, each possess unique cyber vulnerability and severity profile. For instance, within the development stage itself, the cyber risk profile for field development planning significantly differs from that of development drilling.
Source: (ibid).

Companies in the industry, including NOV, need to boost cybersecurity to protect their infrastructure, networks, and data. This entails implementing advanced security protocols such as new policies and practices, adding personnel and funding such as investing in employee training and awareness, and continuously monitoring for potential threats and thus significantly reducing detection and response time (WEF, 2021). By mitigating these cybersecurity risks, companies can better their organizations' resilience by protecting their assets and maintaining stakeholders' trust, as well as maintaining their reputation, while benefiting from technological innovations in the industry.

4.5 Environmental Aspects

Oil and gas extraction activities damage the environment and diminish residents' capacity to farm, fish, and live in a healthy setting, as well as destroying animals' natural habitats. Spills pollute water, air, and crops with harmful substances, including carcinogens that accumulate in certain food crops, such as the previously discussed oil spills in Nigeria's Niger Delta Region between 1991 and 2019. These spills, along with land clearing, gas flaring, and infrastructure development, forced people to seek alternative income sources and made land and waterways unproductive, among others(Nkem et al., 2022).

The awareness on environment issues and negative effects on health have increased substantially in recent years (IMF, 2022). As the public has become more concerned about the environmental impact of the OFSE industry, this shift in sentiment has influenced investors', customers', and regulators' demands for cleaner, more sustainable practices and solutions, as well as increased transparency in ESG reporting. Companies that do not practice ESG reporting risk being regarded as less attractive investments. This shift towards clean and renewable energy, along with growing focus and regulatory pressures on environmental issues, have accelerated the transition towards cleaner energy sources, such as solar, wind, and geothermal power. The OFSE industry is challenged to adapt to these changing market dynamics by diversifying their solutions and technology, as well as investing in R&D to develop more sustainable products and services. The industry has started to invest in several technological advancements to reduce environmental impact, such as carbon capture and storage, automated drilling techniques, and remote monitoring systems. Additionally, companies such as NOV are adopting sustainable practices like recycling drilling fluids, reducing water consumption, and minimizing land disturbance with solutions such as the DFX Fluid System and Dewatering Water-Based Drilling Fluids.

The Energy Transition Outlook 2022 highlights the ongoing global shift towards renewable energy sources and the challenges faced in meeting net zero targets (DNV, 2023). Despite the short-term impact of high energy prices and geopolitical tensions, the long-term transition towards greener energy sources continues, driven by falling renewables costs, electrification, and rising carbon prices. The oilfield services and equipment industry will need to adapt to these changing dynamics as governments and industries seek to meet the Paris Agreement goals.

Electricity is the most essential energy source of the energy transition, with renewables expected to account for an 83% share of the electricity system by 2050, squeezing the fossil fuel share of the overall energy mix below 50% (ibid). Solar and wind energy capacity is predicted to grow exponentially, offering both new opportunities and challenges for the oilfield services and equipment sector. DNV suggests that hydrogen, bioenergy, as well as carbon capture and removal, will play crucial roles in achieving net zero targets. Hence, the NOV and oilfield services and equipment industry can leverage its expertise to contribute to the development of these emerging technologies. By diversifying their portfolios and investing in sustainable solutions, companies in this sector can stay competitive and improve their reputation in a world moving towards net zero.

As DNV reports, the path to net zero requires massive and urgent action to reduce emissions, particularly in high-income countries where no new oil and gas projects will be needed after 2024 (ibid). Leading regions and sectors must move faster, as OECD regions aim for net zero by 2043 and China by 2050. Hence, paving the way for the oilfield services and equipment industry to invest in and develop new technologies that support the transition to cleaner energy sources.

Drilling and pipelines on Indigenous nations' lands and near national parks are controversial issues, with significant environmental and socio-cultural implications. These activities often invade upon sacred sites and threaten the ecological integrity of these areas, which are essential for the wellbeing of Indigenous communities and the conservation of natural habitats and wildlife. According to The Wilderness Society, drilling for oil and gas can lead to deforestation, habitat loss, and disruptions to wildlife migration patterns (TWS, 2021). It may also result in water and air pollution due to the release of hazardous chemicals and greenhouse gases. Pipelines might also pose similar threats, as they can leak, leading to contamination of water sources and soil, which can have severe consequences for both the environment and human health (ibid) and (Nkem et al., 2022).

In recent years, there has been growing public awareness and concern regarding the impacts of drilling and pipeline construction on Indigenous lands and national parks. Protests, legal challenges, and campaigns aim to protect these areas and respect Indigenous rights (Spiegel, 2021). For instance, there is an ongoing legal dispute as both the TMX and Coastal Gaslink projects in Canada have been violating the United Nations Declaration on the Rights of Indigenous People (ibid). Governments, the industry, and stakeholders must work together to

find sustainable solutions that strike a balance between energy development, environmental protection, and Indigenous communities' rights. This includes engaging in consultations with Indigenous nations, ensuring their consent, and adopting environmental regulations to minimize adverse effects on these sensitive areas.

At present, all development activities on public lands, including national parks, must comply with several federal environmental laws designed to protect air, water, wildlife, and public health. Furthermore, operators must follow the respective national park service's regulations concerning oil and gas within park territories. However, this well-established procedure is under threat from politicians, such as certain politicians in Washington, heavily influenced by the oil and gas sector, who suggest reducing or even eradicating federal supervision of energy on public lands in favor of more lenient state regulations (CAP, 2012). As figure 29 illustrates, the Center of American Progress reported in 2012 that only in the U.S., there were 12 National Parks with occurring oil and gas drilling, with as many as 30 National Parks under possible oil and gas drilling threats (ibid).

Figure 29: The figure illustrates the drilling threats to national parks in the U.S. Both national parks with occurring oil and gas drilling, as well as planned

locations are illustrated in the figure.
Source: (ibid)

4.6 Legal Aspects

The OFSE and upstream oil and gas industry operate under a diverse range of laws and regulations that vary by country and region. These laws and regulations cover aspects such as drilling requirements, health, safety, and environmental (HSE) compliance, as well as petroleum legislation. Exploration and production companies often pay substantial upfront concession fees and royalties for the right to operate within a country's borders, and the petroleum sector faces typically higher taxation rules than most industries. Legal costs have substantial effects on the entire petroleum industry, and changes in these laws and regulations can affect the company's costs and operations, as well as its potential liabilities.

A notable shift has occurred within the industry, with well-managed HSE departments now being viewed as a competitive advantage rather than solely a mandatory requirement (DNV, 2023). It is essential to consider that many regulations affecting the industry are established by local governments. Hence, different regions have different laws and regulations governing the industry, such as the Resource Conservation and Recovery Act in the USA, the Petroleum Act in the UK, the Norwegian Environment Agency in Norway, as well as the National Development and Reform Commission in China. However, for the purpose of this thesis, this analysis will not examine the specific regional laws and regulations.

5. Industry Analysis

At this point, the mechanisms of the OFSE industry and the energy market have been discussed. In addition, it has been determined that the WACC method, supported by relative valuation and sensitivities, is the most appropriate valuation method for this purpose. Using the PESTEL framework, a macroeconomic analysis of NOV was conducted in the previous section. From the PESTEL analysis, it was found that recent geopolitical tensions, including attacks on critical infrastructure and the Russia-Ukraine conflict, have caused disruptions and volatility in oil and gas supply and demand. This has affected the OFSE industry recently, while commodity fluctuations and economic development further influence the sector's fundamentals, thus affecting companies like NOV. The oil and gas industry faces increasing socio-cultural pressure and awareness for sustainability and climate action. This is due to several factors, including insufficient reductions in greenhouse gas emissions and increasing spills, as well as a lack of commitment to meet the net zero goals of the Paris Agreement. The industry is also adopting and developing advanced technologies like AI and drilling automation to improve efficiency, safety, and competitiveness. In addition, this sector experiences continuously changing market conditions and regulations that vary by country and region. These factors have resulted in the energy transition and a shift towards cleaner and greener energy sources, as well as diversification into sustainable technologies and practices.

Now, I will continue with an industry analysis of the OFSE industry and address NOV's competitive situation in this industry. The framework used for this industry analysis is Porter's five forces. Porter's five forces was created in 1979 by Harvard Business School professor Michael E. Porter and is widely used since. It is a tool for evaluating a company's competitive environment through analyzing what Porter presented as five forces: the threat of new entrants, power of suppliers, power of buyers, threat of substitutes, and the degree of rivalry among existing competitors (Koller et al., 2020). Porter argues that we have to analyze what drives profitability in the industry to implement a strategy to improve a company´s long-term profitability, and that this framework will provide an overview of these drivers by analyzing all five forces (Porter, 2008).

5.1 New Entrants

The OFSE industry has a wide range of characteristics regarding entry barriers. The industry, as well as upstream oil and gas, is capital intensive and requires significant initial investments in infrastructure, such as R&D centers, logistics and transportation solutions. In addition, it involves significant investments in machinery and equipment for various oil and gas exploration, drilling, and production operations. Procuring, maintaining, and upgrading this equipment requires large investments, which might be challenging for new entrants to secure. In addition, companies need competent experts and engineers in the field and ensure the availability of specialized workers for hazardous tasks, as well as following regulations concerning HSE compliance. This serves as probably the most significant barrier to entry for new players (Yager, 2016).

This sector is also quite costly, which according to Malik (2018) could be measured by the relationship between a region's respective breakeven prices and the oil price. The breakeven price across the U.S. oil patch was approximately $37 in Q1 2023, while the average price forecast for WTI oil is $79,64 at the end of 2023 (Slav, 2023). This suggests that, considering the current technological state, even smaller oil and gas companies are experiencing profits, which could naturally encourage potential entrants. However, because this industry is cyclical by nature, this situation could change dramatically, as in 2016, the situation was completely opposite. In 2016, the Breakeven price in the U.S was higher than $60, while the oil index were at $43 per barrel on average, which implies that even the larger and well-established players would experience losses (Malik, 2018). In addition, advanced technology possessed by existing players can enhance productivity and reduce costs (Santos et al. 1999 in Malik, 2018), making it more challenging for new entrants to compete on the same cost curve.

Furthermore, new players in this industry must possess a strong ability to secure funding, which can be difficult due to significant sunk costs and high asset specificity (Worthington, 1995 in Malik, 2018). The sunk costs and high asset specificity contributes to high exit costs, which in turn also serve as a barrier to entry in both the OFSE and upstream oil and gas industry. These high exit costs may strengthen the existing players' commitment to compete, thus limiting potential new players to join the industry.

First move could be another factor that hinders new players in the industry to establish and serve as a competitive advantage for existing players in the industry. This is due to the fact

that the most lucrative projects from the operators on the largest and the most profitable oil and gas fields, most likely have already been occupied by the major OFSE companies, such as NOV, Baker Hughes, and Halliburton, etc. In addition, operating in the OFSE industry often requires various licenses, permits, and certifications from governments, which can be expensive and time-consuming. New entrants may face challenges in these processes, as well as securing the necessary approvals in order to operate and ensure compliance with laws and regulations.

Numerous pieces of evidence and studies indicate that a challenging competitive advantage for new players in the industry to surpass is the learning curve (Ikoku, 1978). As figure 30 shows, an operator with no prior experience may take up to 20 years to reach breakeven, whereas an experienced operator could achieve the same in just 5 years on average (Malik, 2018). This difference serves as another barrier to entry for new entrants in this sector.

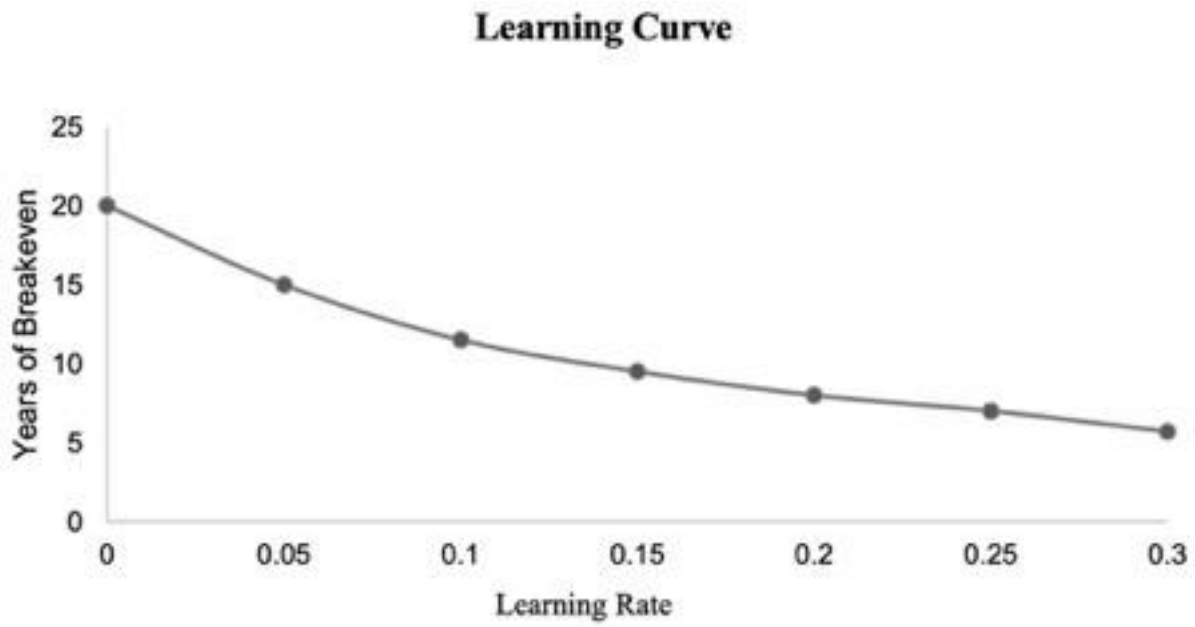

Figure 30: Oil and gas projects' breakeven time and learning rate.
Source: (Malik, 2018)

Consequently, the factors that have been examined constitute significant new entry barriers in the OFSE and upstream oil and gas industry, which might lead to reducing the number of new entrants. As a result, companies already operating in this sector may be able to generate economic profit, while all other factors remain constant.

5.2 Suppliers

The bargaining power of suppliers for NOV and the OFSE industry is influenced by various factors, including the vulnerability of supply chains for metals and resources, energy security, and the growing focus on securing critical resources for the energy transition. In addition, the number of investors in this industry has increased, yet there are a limited number of suppliers. This has resulted in suppliers being more reluctant to sell their critical materials to OFSE companies that do not meet their respective criteria and standards, which in turn increases the competition in the industry and strengthen the bargaining power of companies that offer raw materials.

Disruptions in supply chains, particularly for metals, can have a more substantial impact on the production of batteries, solar panels, and wind turbines than on fossil fuel production. Hence, the EU has developed metal alliances with suppliers in the US, Middle East, Africa, and South America. However, most of these disruptions can eventually be circumvented through alternative chemistries, new production sites, and new materials. Nevertheless, in the short term, up to 2030, these supply-chain disruptions may slow down the energy transition (DNV, 2023).

Energy security is a top priority for many countries, including China, where the majority of coal is supplied domestically, but a significant portion of natural gas and oil is imported. Non-fossil energy sources such as nuclear, bioenergy, and renewables are also primarily developed domestically, with limited reliance on foreign resources except for minerals and metals needed for wind turbines and solar panels. This growing focus on energy security extends to securing the supply of critical resources, prompting many regions to review their strategies and dependence on other regions to provide the raw materials necessary for securing their energy supply or transition. This effect may exacerbate existing imbalances and affect costs in the short to medium term (ibid).

The bargaining power of suppliers can be influenced by the relationship between growth in oil prices and drilling costs. As previously examined, this relationship has a positive correlation, which indicates that manufacturers and service companies in the petroleum industry are quite adaptable, as these firms adjust their cost structures to match fluctuations in oil prices. This flexibility allows the supplier to negotiate higher prices when economic conditions are favorable. On the other hand, during periods of low oil prices, these firms are forced to lower

their prices due to the high dependency OFSE companies have on upstream oil and gas companies' demand for different solutions and technologies across their value chain. In addition, when the industry experiences downturns, manufacturers and service companies need to shift towards more integrative and partnership-based operational models with their customers in the OFSE sector, such as the partnership between NOV and Aker Solutions in Norway. This emerging trend of supplier-client partnership operational models emphasizes the importance of fostering strong relationships and strategic partnerships between NOV and its suppliers to ensure mutually beneficial outcomes.

Moreover, when considering a more ambitious energy transition that aims to reduce emissions in line with a Paris-compliant 1,5°C future, there will be additional strain on resource demands. Every national plan for reaching net-zero should include a plan for securing required natural resources. Many of the minerals and metals needed are found in low-income countries, which could benefit from climate finance support, potentially becoming a crucial aspect of negotiations around accessing such resources. These factors highlight the importance of NOV and other OFSE companies maintaining strong relationships with their suppliers and adopting strategies to mitigate the risks associated with potential supply chain disruptions and resource constraints. In summary, the bargaining power of suppliers may not be strong enough to significantly impact the performance of firms like NOV.

5.3 Consumers

The buyers in the OFSE industry are primarily oil and gas exploration and production companies, which can range from major oil and gas companies, independent exploration and production companies, and national oil companies. If the market is dominated by a few large buyers, they may have greater bargaining power to negotiate better terms and conditions, putting pressure on the prices and profit margins of OFSE companies like NOV. However, as examined earlier in this analysis, the OFSE industry lacks credible alternative energy sources to oil and gas and has substantially high switching costs to other alternatives. In addition, the OFSE industry often involves long-term contracts and relationships between suppliers and buyers. When buyers are locked into long-term agreements, in combination to the high switching costs, their bargaining power may be limited.

Furthermore, oil and gas producers are often large multinational corporations, which might reasonably increase their bargaining power and allow them to push prices down. In addition, the major crude oil sellers have formed OPEC, which could further increase buyers' ability to negotiate lower prices, while enabling OPEC members to prevent drastic price drops, primarily by determining production quotas. However, OFSE companies may still be able to maintain higher prices, as their solutions and technologies tend to be well-specific with substantial quality variations. The buyers in the oil and gas industry are also often sensitive to oil and gas price fluctuations, especially during periods of highly volatile oil prices. When oil prices are low, upstream oil and gas companies may seek to reduce costs, which can lead to increased pressure on OFSE companies to lower their prices. However, due to the nature of the OFSE industry, neither buyers nor sellers have substantial bargaining power. In addition, the prices of OFSE companies' products and services are to a large extent affected by the relationship between supply and demand. Hence, the bargaining power of buyers can be characterized as moderate.

5.4 Substitutes

While numerous alternative energy sources exist, including geothermal, wind, and solar energy, none can currently replace oil and natural gas entirely due to technological limitations. Oil and natural gas offer a stable baseline energy source, which the alternative energy sources such as solar and wind cannot consistently provide. For instance, solar power depends on daylight, while wind power is more effective when there are most wind, typically at night. The lack of efficient energy storage methods for alternative sources makes fossil fuels necessary for maintaining a steady energy supply in power plants. However, advancements in storage technology could significantly affect NOV's business negatively.

Fossil fuels encounter multiple challenges, including substitution threats in various energy subsectors, pressure to scale up carbon capture and storage, and capital markets favoring non-emitting energy sources with lower capital costs (DNV, 2023). DNV (2023) estimates a gradual phase-down of fossil fuels, starting with coal and later oil and gas, is expected. In addition, the share of fossil fuels in the electricity mix is projected to decline from 59% to 12% by 2050. In several regions, solar PV and wind power are already the most cost-effective alternative electricity sources and are expected to grow exponentially, with solar PV accounting for 38% and wind 31% of the electricity mix in 2050 (ibid). Although renewable

sources are competitive with fossil fuel-based electricity, it will take considerable time for low- and zero-carbon energy sources to replace fossil fuels in the broader energy system.

When examining the energy transition's impact on material demand, solar PV panels are anticipated to primarily use crystalline silicon cells, with silicon being an abundant material. However, there are limitations to the processing facilities needed for photovoltaic panels (USGS, 2020 in DNV, 2023). Emerging thin-film technologies can further reduce overall material demand. To reduce lifecycle emissions from wind, the hard-to-abate industries will experience increased pressure due to the fact that wind turbines currently require substantial amounts of steel and cement.

Due to the increasing awareness of the energy transition, the industry will experience a big shift towards cleaner and sustainable energy sources, which in turn will increase the threat of substitutes. However, over the medium to long term, lacking energy storage technologies and the fact that significant progress in the global energy transition will take a lot of time to complete, the overall threat of substitutes can be characterized as moderate.

5.5 Rivalry

There are numerous OFSE firms that exist on a global basis, and the sector is primarily dominated by the major players. NOV, Schlumberger, and Halliburton are among the largest companies in the industry, and they experience substantial competition from other large market players. These companies are fighting to sustain their position in the OFSE sector by continuously competing for contracts from major oil and gas exploration and production companies. Cyclical downturns such as fluctuations in oil and gas prices can intensify this internal rivalry by reducing demand and potentially lowering prices for OFSE projects.

In recent years, the industry has experienced fluctuations due to economic, geopolitical, and environmental factors. As the OFSE industry is significantly influenced by global oil and gas demand, slow industry growth can intensify competition as companies fight for a larger share of a shrinking market. In addition, OFSE companies differentiate themselves by offering unique and well-specific technologies, services, and solutions for their customers in the upstream oil and gas sector. NOV, for instance, focuses on innovation and technology development to gain a competitive edge. If their competitors are able to offer similar products

and services, the rivalry will intensify as they will struggle to differentiate themselves from one another. Differentiating themselves becomes rather difficult when the industry experiences downturns or lower oil and gas prices, because this will usually lead to CAPEX cuts in the upstream oil and gas sector, which in turn affects and puts pressure on the OFSE industry. On the other hand, switching costs are high, and thus customers may be less likely to change suppliers, which in turn will result in a lower level of competition. Consequently, competitive rivalry in the OFSE industry can be characterized as moderate.

5.6 Summary of competitive situation

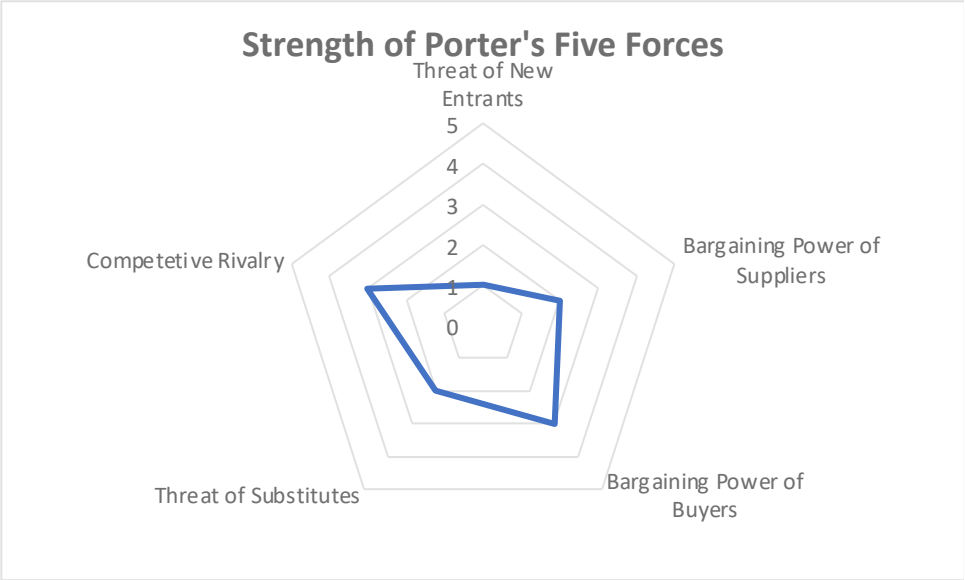

Figure 31: This figure summarizes the competitive situation in the OFSE industry through Porter's five forces.
Source: Own analysis

6. Company Analysis

So far, the mechanisms of the OFSE industry and the energy market have been discussed, as well as selecting the WACC method, supported by relative valuation and sensitivities, as the most appropriate valuation method for this analysis. The macro environment surrounding NOV in the PESTEL analysis, as well as addressing NOV's competitive situation in the industry using Porter's five forces have also been investigated. I have found that recent commodity fluctuations, geopolitical tensions and the energy transition have disrupted the industry and are expected to continue to affect the sector in the upcoming years. In addition, the investigation suggests that the strength of Porter's five forces is moderate to low overall. It also suggests that the threat of new entrants and internal rivalry serve as the least and most substantial threats for the sector, respectively.

The PESTEL and Porter's five forces analyses will serve as a reliable basis when determining how NOV is positioned compared to their competitors in the industry, using a SWOT-analysis. Hence, one could address NOV's strengths, weaknesses, opportunities, and threats. The SWOT-analysis is credited to Albert Humphrey in the 1960s and examines internal (strengths and weaknesses) and external (opportunities and threats) elements that may affect how a company will perform in the future (Gürel, 2017).

6.1 Strengths

NOV has a proven track record and long history of providing innovative and advanced products and services to the upstream oil and gas industry. This has facilitated the company to establish itself as a market leader in the OFSE industry. The firm's strong reputation is built on its ability to develop innovative and cost-effective solutions and technologies for the upstream oil and gas industry, which could help the company obtain new customers, as well as secure partnerships, joint ventures, or strategic alliances. In addition, NOV's strong standing in the industry could help the company charge higher prices for its products and services, which in turn can improve profitability.

Due to operations in major oil and gas regions such as North America, South America, Europe, the Middle East, and the Asia-Pacific region, NOV's global presence is strong. Hence, NOV has a substantial market position and a wide range of customers, which allows the company

to spread its risk across multiple markets and benefit from local and regional growth opportunities. In addition, NOV's strong presence worldwide improves the company's ability to build strong relationships with local governments and customers. NOV's global presence could also give the firm stronger bargaining power in relation to its suppliers, thus potentially allowing the company to secure more favorable terms.

NOV develops several unique solutions and services for the upstream oil and gas industry, such as drilling and wellbore equipment, completion, and production solutions, as well as digital and automation technology. Hence, the company has a highly diversified product portfolio, which reduces dependence on any specific product or service. This will in turn make NOV more resilient to disruptions in the market, such as oil and gas price fluctuations. The company also invests heavily in R&D to improve its solutions and services, as well as developing new innovative technologies. As the industry shifts towards cleaner and more sustainable technologies and alternative energy sources, the investments in R&D could help NOV capitalize on opportunities in the market and take an active role in the global energy transition.

The company has a highly experienced and skilled workforce that includes leaders, engineers, innovators, and researchers, etc. This set of experienced people is able to test, develop, and manufacture a broad set of cutting-edge and well-specific products and services for the upstream oil and gas industry. In an OFSE industry that requires constant adaptation, NOV could by leveraging their experience and knowledge in the game, increase their ability to anticipate industry trends, including new technologies, market trends and changing customer demands. This gives the company a competitive advantage, and thus increases NOV's ability to attract top-tier talent to ensure that the company remains competitive, adaptive, and set for continued growth. In addition, this capacity not only enhances the company's reputation but also fosters long-term relationships with customers, who come to rely on NOV for their expertise and innovation.

6.2 Weaknesses

NOV faces weaknesses and challenges due to its dependence on the cyclical upstream oil and gas industry and limited diversification. The company's reliance on this sector exposes it to fluctuations in oil prices, global demand, and the impact of economic downturns. Shifts in

energy consumption patterns and changes in government policies aimed at reducing reliance on fossil fuels could substantially affect NOV's margins. In addition, NOV's primary focus on the upstream oil and gas sector restricts its diversification, leaving it vulnerable to risks associated with market downturns or declining demand for oil and gas services. However, to mitigate this weakness, NOV could consider investing more in other sectors or energy markets, such as renewables or downstream services, which would help diversify its revenue streams and reduce its vulnerability to different market dynamics in the oil and gas industry.

Due to NOV's complex organizational structure, which is a direct result of its global operations and American owners, the company could face substantial challenges. The company faces several issues because of its hierarchical organization structure. This is especially a significant barrier to region-specific issues due to the fact that NOV's headquarters in Houston potentially has the last word on all key issues and takes most of the key decisions. The intricacy of its structure can lead to communication barriers, delays in decision-making, and inefficient allocation of resources. These issues could hinder NOV's ability to respond urgently to market changes and maintain a competitive edge. Hence, the company should focus on streamlining its organizational structure and better the coordination and collaboration among its business units and regions (Nimmagadda et al., 2006).

6.3 Opportunities

The increasing global demand for oil and gas, particularly in emerging markets, presents significant growth opportunities for NOV. As the world's population continues to expand, the need for energy resources is expected to rise, creating opportunities for NOV and the industry (DNV, 2023). To capitalize on this growing demand, NOV should consider increasing its production capacity and operations in emerging markets because of the high growth potential. Expanding into these regions would not only enable the company to meet rising energy demand but also increase its market share and global presence. In addition to meeting the growing demand for oil and gas in these regions, NOV has the opportunity to expand into new markets, further solidifying its position in the industry. By exploring untapped markets such as several areas in Africa, NOV can diversify their revenue streams, and thus reduce its dependence on any single region and mitigate risks associated with downturns in the market.

The rising awareness of climate change and sustainability in the oil and gas industry presents significant opportunities for NOV. By developing sustainable technologies and services that minimize emissions or promote energy efficiency, NOV can meet evolving demands for alternative energy sources. In addition, this increased emphasis on sustainability can improve NOV's reputation as a green and environmentally responsible energy organization. Moreover, government incentives, which became more prominent during the COVID-19 pandemic, offer potential advantages for NOV, such as incentives to develop more sustainable solutions and make their operations greener (ibid). These incentives can include tax reductions, subsidies, and grants for businesses operating in specific sectors or meeting particular criteria. Furthermore, securing government contracts can provide a steady income stream for the company and ensure compliance with relevant regulations. Hence, by capitalizing on the potential of sustainability and government incentives, NOV can strengthen its position in the market and improve its further growth.

Technological advancements and digital solutions, such as artificial intelligence (AI), machine learning, and the Internet of Things (IoT), have greatly impacted the OFSE industry by enabling the development of innovative equipment, tools, and processes. These innovations have improved oil and gas exploration and production activities, reduced costs, and minimized environmental impact. Continuous advancements in this area aim to address environmental concerns by optimizing water usage, enhancing wastewater treatment, and eliminating methane leaks. By investing in R&D and technology, NOV can mitigate some of the risks associated with the cyclical nature of the OFSE industry, as reducing the impact of market volatility and maintain a more stable revenue stream. In addition, NOV and the OFSE industry are currently embracing digital technologies to optimize operations, streamline decision-making, and enhance efficiency, and such technologies are expected to increase exponentially in the upcoming years (Ransbotham et al., 2017).

Automation, AI, and machine learning are increasingly used in the oil and gas sector to improve preventative maintenance solutions, reduce equipment damage, and minimize safety risks for workers. NOV, for example, already provides drilling automation solutions such as intelligent control systems, advanced material handling, and remote operation, all of which contribute to a safer work environment and lower maintenance costs. AI could also enable the extraction of valuable information from hazardous locations, minimizing risks to workers and improving safety measures.

In the highly competitive OFSE industry, NOV's ability to stay ahead of its major competitors relies heavily on its capacity to retain and nurture the best talents. A skilled workforce is essential for driving innovation, delivering exceptional service and quality, and sustaining overall performance. As such, it is important for NOV to establish and invest in comprehensive talent management strategies. This includes providing employee development opportunities, offering market-leading incentive plans, and cultivating a supportive and engaging work environment. NOV should address these challenges to thrive in the oilfield services sector and solidify its position as a leading player in the industry, as well as to ensure that the company retains and attracts the brightest professionals and secures the expertise needed.

6.4 Threats

As previously examined in this analysis, NOV's performance is highly influenced by the oil and gas industry. The company can be affected by factors such as CAPEX cuts in the upstream oil and gas sector, oil and gas prices, as well as global supply and demand fluctuations, and political tensions. As a result, the company's revenue and profitability might be very volatile and difficult to forecast. In addition, the company's reliance on the oil and gas industry exposes it to the industry's cyclical behavior, which can have a substantial impact on its earnings and profitability. The cyclical nature of the industry might also lead to highly volatile revenues and profitability, making it difficult to anticipate and plan for. This might make it challenging for the organization to budget and prepare for the future, as well as cause cash flow issues.

The competition in the OFSE industry pose as a threat for NOV, with many competitive, large, and well-established players. In this sector, there are numerous companies competing for contracts, market share, and cutting-edge technological innovations, and thus the pressure on NOV is constant to stay ahead of its rivals. The industry is dominated by major players, including Schlumberger, Halliburton, and Baker Hughes, which further intensifies the competitive environment in the sector. This increasing competition can lead to several challenges for NOV. First, it may result in downward pressure on prices, as OFSE companies strive to offer their solutions and services at competitive rates. This can, in turn, affect NOV's margins and overall financial performance. Second, to remain one of the leading companies in the industry, NOV must continually invest in R&D to create innovative solutions and maintain its technological edge.

Earlier in the analysis, I examined how the macroeconomic environment in the OFSE sector is affected by geopolitical risks. Geopolitical risks serve as a significant threat to NOV, as they can create uncertainty and volatility in the market. These risks can stem from various factors, including political instability, trade disputes, changes in government policies, regional conflicts, and economic sanctions, etc. Such risks can disrupt the oil and gas supply chain, impact demand, and create severe challenges for companies like NOV operating in the affected regions. As previously analyzed, one recent example is the ongoing Russia-Ukraine conflict. The escalating tensions have led to disruptions in oil and gas supplies, affecting global energy markets and causing fluctuations in commodity prices. As a result, OFSE companies, including NOV, face uncertainties and potential losses due to interrupted operations in the region, as well as wider aspects such as supply chain and demand disruptions.

Another example is the ongoing tensions between the United States and Iran. The imposition of several economic sanctions on Iran has led to a decrease in oil production and exports from the country. This has not only impacted the global oil market but also affected companies like NOV that provide services and equipment to the Iranian oil and gas industry. Trade disputes can also impact NOV, as seen in the recent tensions between the United States and China. Tariffs and restrictions on imports and exports can create challenges for NOV in terms of accessing key markets, increasing costs, and negatively affecting their operations. Geopolitical risks can also arise from environmental concerns and growing pressure on the energy transition. Governments worldwide are implementing stricter regulations on carbon emissions and promoting the adoption of cleaner energy sources. This shift in energy policies has a direct impact on oil and gas demand, and thus, affects the OFSE industry and NOV.

7. Historical Accounting Figures

At this stage, I have examined NOV's strategy and its position as a market leader in an OFSE industry with promising prospects. I have also concluded that the fundamental valuation approach, and computing NOV's equity cost of capital using the WACC method, are the most suitable valuation methods for this analysis. In this section, NOV's historical accounting figures, which will serve as the foundation for the forecasting, will be presented. In the previous chapters, I investigated the outlook for both the oil and gas industry and energy markets, along with exploring industry-specific and company-specific strategic factors. These aspects are vital in shaping the prognosis for NOV.

Before the forecasting of NOV's future performance can be conducted, it is essential to examine the company's historical financial statements, as they provide valuable context and insight into its financial history. In this financial statement analysis, I chose not to normalize the income statement and balance sheets. This is due to the fact that the purpose of this analysis is for investors to make unbiased decisions, and thus the financial statement analysis needs to reflect an accurate picture of the financial statements as a result. In addition, for the purpose of this analysis, the balance sheets will not be restructured.

In the financial statement analysis, the time period that is being used for the historical figures is 3 years. This is due to the fact that a longer time period will not reflect the current state of the company as properly. This is also consistent with Damodaran's recommendations (Damodaran, 2012). In addition, there have been some vital events recent years that have affected the company and the world economy in general. For instance, the COVID-19 pandemic and the Russia-Ukraine conflict, which is expected to have long-term effects on the industry outlook and global energy demand, as previously discussed. One may argue that 5-10 years should be used a the historical figure to reflect "normal operations". For instance, many may perceive the COVID-19 pandemic and the Russia-Ukraine conflict as temporary, and although they may have long-term impacts, the financial statements may not be as representative of recent years. Hence, if coupled with somewhat older financial reports, these could potentially be more representative on average. This approach could thus enable us to determine NOV's figures for a "normal year".

The goal of this financial statement analysis is to generate quantitative data concerning past financial performance to serve as a basis for the forecasting. As such, it is important to choose

a period for the historical financial analysis that aligns with the current state and operational characteristics of the company. Generally, if a firm has undergone substantial changes in its operational dynamics in recent years, a lengthy historical analysis might not yield the best insights into its future financial performance. As a result of my previous work experience at NOV, I found out that the company's operational characteristics have undergone significant changes, particularly since 2020. During my time at NOV, I learned that the company has increased their focus on renewable energy solutions. I also learned that they have applied for funding from several different Research Councils worldwide regarding new technologies and solutions in the renewable energy segment. This includes both offshore and onshore wind power, hydrogen, subsea storage of ammonia, and carbon capture technologies, among others. For instance, the company signed a new join industry project as part of the final validation of subsea storage technology with The Research Council in Norway in February 2022, which they applied for between 2020 and 2021 (NOV, 2022). Further, since NOV's revenues have fluctuated from $21,440 to $8,479 billion between 2014 and 2019, NOV's current state is far from reflected in this data. I assume that including these older financial statements would introduce more inaccuracies than advantages to the assessment. Hence I would argue that examining NOV's financial statements over a 3-year period is appropriate for this analysis.

As I finalized and locked the inputs for this analysis prior to the release of the company's 2022 Annual Report, it was necessary to provide an estimate of Q4 (2022) results to provide a solid foundation for the forecasts. The method used to estimate the 2022 figures combines the company's trailing 12 months (TTM), an analysis of the relationship between Q4 2020 and Q4 2021, and calculations of Q4 (2022) figures based on the first three quarters' results in 2022, in addition to the estimates for the period. The strategy used for the estimates for most financial line items in this financial statement analysis is premised upon two distinct approaches, to which I assign weights of 80% and 20%, respectively. The first approach involves obtaining isolated figures for the fourth quarter in both 2020 and 2021. Subsequently, I compute the average of these values and add the corresponding value for the third quarter as of 2022. The other approach involves dividing the figure corresponding to the third quarter by three, and then adding the obtained value to the original third quarter figure.

The estimated value for each item line will be derived from the weighted sum of these two methods, with the first and second approaches contributing 80% and 20%, respectively, to the final estimate. This method may be unorthodox, but I can assume that this approach will reflect the trends and provide a sufficient estimate. There are three significant deviations from the

estimation process for revenues, cost of goods sold (COGS), and operational expenses. For these financial line items, the estimated value is determined by factoring in the isolated growth rate observed between Q4 of 2020 and 2021. This rate is then increased by a premium of 25%, based on the strategic analysis and market outlook for 2022. For instance, I have found that the high oil and gas prices earlier in 2022 significantly affected NOV's profitability, and that the firm has a strong global presence with a comprehensive portfolio of solutions and technologies. In addition, the company has increased their portfolio of renewable energy solutions, as well as drilling automation and artificial intelligence technology. This portfolio has experienced tremendous growth in the last years. The computed growth rate is subsequently applied to the figures recorded as of Q3. In the concluding section, I will explore how the estimated figures for 2022 align with the actual developments that occurred within that year.

7.1 Consolidated Income Statement

The consolidated income statement illustrated in table 1 dates back to 2020 and should adequately illustrate the prevailing trends. Table 1 shows NOV's historical consolidated income statement, highlighting a relatively volatile sales growth. It is worth noting that the line items in the consolidated financial reports in the historical analysis period are not affected by abnormal figures. However, the gross profit margin has shown relative stability and I estimate it to be more stable in 2022. The EBITDA margin has exhibited more volatility than the gross profit margin, primarily due to fluctuations in capital asset impairment.

Table 1: Consolidated Income Statement (2020-2022)

	2020A	2021A	2022E
Revenues	6 090	5 524	7 194
Growth		-9,3%	30,2%
COGS	5 656	4 750	5 953
Gross Profit	**434**	**774**	**1 241**
Gross profit margin	7,1%	14,0%	17,3%
Operating expenses	968	908	1 099
EBIT	**-2 695**	**-153**	**192**
Depreciation and amortiza	352	306	300
EBITDA	**-182**	**172**	**442**
EBITDA margin	-3,0%	3,1%	6,1%

Source: NOV Annual Report, 2019-2021, NOV Q3 2020-2022 Reports, as well as NOV Q4 2020 & 2021 Reports. In addition, this analysis is also based on author's own estimates for 2022.

NOV experienced a challenging period in 2020 and 2021, due to the COVID-19 pandemic. As previously examined, lockdowns and steep declines in energy demand led upstream oil and gas operators to put new projects on hold and permanently close high-cost operations, leading to lower OFSE demand. Despite this, in 2021, the company successfully managed to cut down its COGS, even when revenues experienced a slightly higher dip compared to 2020. The year 2022, however, saw a significant surge in revenues, buoyed by a rebound in the global oil and gas industry and the consequential high energy prices. NOV's EBITDA margins were -3% in 2020 and improved to 3,1% in 2021. Since then, I expect both revenues and margins to increase, with estimates reaching $7,194 billion and 6,1% respectively, in 2022. When compared to the industry average EBITDA-to-sales ratio, as obtained by Damodaran (2023), NOV's estimated ratio in the year of 2022 is below this average, indicating lower relative profitability than the average industry peer. It is important to note, however, that EBITDA is a non-GAAP financial measure, and its exclusion of debt can pose limitations and has its drawbacks when measuring a company's performance.

7.2 Assets

Table 2 provides a breakdown of NOV's assets and illustrates that a significant proportion of the company's non-current assets are constituted of property, plant, and equipment (PPE), goodwill, and intangibles. The estimated decline in cash and cash equivalents in 2022 is due to an increase in working capital and other operating assets. Net receivables and inventories represent the most notable current assets, both of which are estimated to have experienced substantial growth in 2022, which, in turn, is expected to result in increased cash payments in future periods, assuming other factors remain constant.

Table 2: Consolidated Balance Sheets (2020-2022)

Current Assets	2020A	2021A	2022E
Cash and cash equivalents	1 692	1 591	1 117
Receivables, net	1 274	1 321	1 704
Inventories, net	1 408	1 331	1 740
Contract assets	611	461	651
Prepaid and other current assets	224	198	231
Total current assets	**5 209**	**4 902**	**5 443**
Non-Current Assets			
Property, plant and equipment, net	1 927	1 823	1 847
Lease right-of-use assets	566	537	539
Goodwill and intangibles, net	2 020	2 030	2 159
Other assets	207	258	321
Total non-current assets	**4 720**	**4 648**	**4 867**
Total Assets	**9 929**	**9 550**	**10 309**

Source: NOV Annual Report, 2019-2021, NOV Q3 2020-2022 Reports, and NOV Q4 2020 & 2021 Reports, as well as author's own estimates for 2022.

The inventory is comprised of a wide range of assets, including finished goods, spare parts, work in process, and raw materials, all of which support ongoing manufacturing operations and NOV's extensive installed base of highly specialized oilfield equipment. The estimated carrying value of the inventory is influenced by various factors, such as levels of oil and gas well drilling and remediation activity, global economic growth projections, political stability and regulatory environment in major oil and gas producing regions, etc. Currently, the company is actively pursuing, and intends to continue pursuing, claims related to revenue recognized for drill bit technology. NOV has initiated lawsuits for breach of agreements against certain drill bit manufacturers who licensed the company's intellectual property. NOV's claims for outstanding receivables currently exceed $30 million and are anticipated to continue rising until a resolution is reached (NOV, 2022).

The estimated asset turnover ratio for NOV in 2022 stands at 72%, a figure derived from dividing revenues by average total assets. When compared with the Q4 2022 energy sector benchmark, as estimated by CSIMarket at 1,09, this suggests a less efficient utilization of assets by NOV. In comparison to the wider energy sector, NOV appears to be less efficient at generating sales or revenue from its asset base, indicating potential areas for operational improvement.

7.3 Liabilities

Table 3 provides a detailed breakdown of NOV's liabilities, highlighting that non-current long-term debt forms the most substantial single liability within NOV's financial structure. This long-term debt encompasses different Senior Notes, which contributes to over $1,5 billion, in addition to other forms of debt. The company also maintains a revolving credit facility with a borrowing capacity of $2,0 billion. However, NOV had no outstanding letters of credit issued under this facility, leaving the entire $2,0 billion as available funds. The largest current liability on the balance sheet is accrued liabilities, estimated to be $966 million in 2022. These accrued liabilities consist of compensation, warranties, insurance, vendor costs, non-income taxes, among other items.

Table 3: Historical Levels of Liabilities (2020-2022)

Current Liabilities	2020A	2021A	2022E
Accounts payable	489	612	868
Accrued liabilities	863	778	966
Contract liabilities	354	392	440
Current portion of lease liabilities	110	99	89
Current portion of long-term debt	0	5	13
Accrued income taxes	51	24	37
Total current liabilities	**1 867**	**1 910**	**2 413**
Non-Current Liabilities			
Long-term debt	1 834	1 708	1 840
Lease liabilities	612	576	573
Other liabilities	337	292	335
Total non-current liabilities	**2 783**	**2 576**	**2 748**
Total Liabilities	**4 650**	**4 486**	**5 161**

Source: NOV Annual Report, 2019-2021, NOV Q3 2020-2022 Reports, as well as NOV Q4 2020 & 2021 Reports. In addition, this analysis is also based on author's own estimates for 2022.

NOV's estimated long-term debt-to-equity ratio for 2022 is approximately 36%, computed by dividing long-term debt by total equity. This figure, when compared with Damodaran's estimate of 39,6% for the 2022 oil and gas services and equipment sector, suggests that NOV maintains a relatively solid financial foundation that allows for financial sustainability (Damodaran, 2023) & Gleißner et al. Although NOV's capital structure aligns fairly well with its industry peers, the company's reliance on debt financing is slightly lower than the sector

average. This could be indicative of NOV's conservative capital structure and financial approach compared to its peers (NOV, 2022).

7.4 Equity

As per the projected figures for 31st December 2022, total equity constitutes 49.9% of the total equity and liabilities. Table 4 below shows that the primary components of NOV's total equity consist of additional paid-in capital and retained earnings. Throughout the observed period, both additional paid-in capital and retained earnings have shown relative stability. The company's retained earnings, however, need further explanation. From 2015 to 2021, NOV recorded negative earnings each year. Negative earnings from earlier periods contributed to negative retained earnings. Notably, 2022 saw a positive change due to strong financial figures for this year. Given that the company has achieved robust EBITDA margins (before non-recurring items) in recent years, it is reasonable to expect a positive shift in accumulated retained earnings in the foreseeable future.

Table 4: Historical Levels of Equity (2020-2022)

Equity	2020A	2021A	2022E
Common stock - par value $.01; 1 billion shares authorized; 392,673,077	4	4	4
Additional paid-in capital	8 591	8 685	8 783
Accumulated other comprehensive loss	-1 509	-1 546	-1 665
Retained earnings	-1 876	-2 146	-2 011
Noncontrolling interests	69	67	37
Total Equity	**5 279**	**5 064**	**5 148**

Source: NOV Annual Report, 2019-2021, NOV Q3 2020-2022 Reports, and NOV Q4 2020 & 2021 Reports, as well as author's own estimates.

NOV maintains a cash flow hedging program to protect against fluctuations in projected foreign currency cash flows, primarily arising from forecasted revenues and expenses. When a derivative instrument qualifies as a cash flow hedge, the derivative's gains or losses are recorded in "Accumulated other comprehensive loss" and reallocated into earnings, aligning with the line item associated with the projected transaction and the period in which the hedged transaction influences earnings (NOV, 2022).

7.5 CAPEX

NOV is a market leader across several segments and experienced a considerable increase in revenue last year, after a period of decreasing revenues due to the implications of the COVID-19 pandemic and geopolitical tensions. As a well-established organization, it is positioned for an increase in capital expenditures (CAPEX) to drive growth, particularly due to the impact of the energy transition. CAPEX generally comprises investments in non-current assets, subtracted by the disposal of such assets, but excludes assets procured through acquisitions and non-current items. Investments in intangible assets, along with tangible non-current assets like PPE, may also be classified as CAPEX according to Kinserdal et al. (2019). For the years ended December 31 in 2020, 2021, and 2022, CAPEX amounted to $226 million, $201 million, and $205 million, respectively (NOV, 2022 & 2021) & (Author's own estimates). This is illustrated in table 5, along with the respective CAPEX to revenue ratios.

Table 5: Historical CAPEX and CAPEX to Revenue Ratio between 2020 and 2022.

	2020A	2021A	2022E
CAPEX	**226**	**201**	**205**
CAPEX to Revenues ratio	3,71%	3,64%	2,84%

Source: NOV Annual report 2020 and 2021, as well as author's own estimates.

In light of NOV's historical CAPEX volatility, it could be necessary to normalize these figures before projecting future cash flow levels. Damodaran (2012) suggests several techniques for accomplishing this, one of which is averaging CAPEX over a given period. Companies with a limited historical record or those whose operational strategies have transformed over time might alternatively consider industry averages of CAPEX in relation to a base input (ibid). However, when examining the industry average CAPEX/Sales ratio for oil and gas services and equipment, the ratio provided by Damodaran (2023) is 0,3%, which is approximately 10 times lower than NOV's five-year average.

It is generally expected that a company's investments should equal depreciation and amortization when it reaches a steady state. Given that depreciation and amortization have consistently exceeded NOV's CAPEX over this period, it is unlikely that the company will

achieve a steady state in the near future. One could argue that NOV is undergoing a change in operational strategy due to the ongoing energy transition, which might require a look at industry averages. However, considering NOV's historical CAPEX is traceable, one could argue that using the historical data, in relation to the base input to project NOV's future CAPEX. Hence, this is the method that will be used in this analysis.

7.6 Working Capital

Net working capital (NWC) is an important metric for operational efficiency and is calculated by subtracting current liabilities from current assets, which is illustrated in the equation below. The resulting figure represents the amount of capital that is tied up directly in the firm's day-to-day operations.

$$NWC = Current\ Assets - Current\ Liabilities$$

In the context of valuation, a more nuanced approach to net working capital is adopted that focuses solely on operational aspects. This approach, often referred to as "operating working capital", involves the exclusion of investments in tradeable securities and excess cash from current assets, along with the removal of all interest-bearing debt from current liabilities. This adjustment narrows down the focus to assets that are necessary for the business operation and liabilities that are directly linked to the ongoing operations (Koller et al., 2020). Moreover, the consideration is limited to those items that exhibit a growth pattern aligned with revenue (Kinserdal et al., 2019). Consequently, net working capital, being a part of the operational capital, should only comprise of operational assets and liabilities for precise calculation (Berk & DeMarzo, 2014). This method of calculating net working capital is illustrated in the following equation.

$$NWC = Inventories + Accounts\ Receivables + Operating\ Cash - Accounts\ Payable$$

The following discussion will examine the components of NOV's operating current assets and categorize them according to the constituents of the net working capital equation. Starting with NOV's inventories, these align with "Inventories" and are consistent with the NWC framework. Furthermore, NOV's receivables fit into the "Accounts Receivables" category of the equation. In addition, "Contract Assets" representing unbilled amounts when recognized

revenue surpasses the amount invoiced to the client under contracts where revenue is acknowledged over time, are also included in this category (NOV, 2022).

It is common for corporations to retain a surplus of cash and tradeable securities beyond their operational necessities. Hence, it becomes essential to compute an estimate of the capital required for the day-to-day operations of the firm. In this context, Kinserdal et al. (2019) introduce a heuristic guideline that assumes that a firm typically needs an operational cash reserve equivalent to 10% of its inventories and tradeable receivables. The determination of the operating cash segment can be facilitated by the methodology proposed by Kinserdal et al. (2019), as demonstrated the following equation.

$$Operating\ Cash = 10\%\ (Inventories + Receivables)$$

The subsequent phase involves an examination of operating current liabilities, which usually comprise of liabilities related to various stakeholders such as suppliers, employees, customers, and the government (Koller, Goedhart, & Wessels, 2020). For NOV, the most substantial liability is accrued liabilities, accounts payable and contract liabilities, respectively. Contract liabilities consist of advance payments, billings surpassing recognized revenue, and deferred revenue (NOV, 2022). Additionally, accrued income taxes represent a fiscal obligation to the government.

NOV's net financing debt equals $1,081 based on estimated 2022 figures. Net financing debt is computed by the following equation.

$$Net\ Financing\ Debt\ =\ Cash\ and\ Cash\ Equivalents - Operating\ Cash - Current\ Portion\ of\ Long\ Term\ Debt - Long\ Term\ Debt$$

As firms expand, they often incur increased working capital requirements. Consequently, Kaldestad & Møller (2016) suggest conducting a historical analysis of working capital levels, which becomes the basis for projecting future levels in this analysis. Table 6 illustrates NOV's historical working capital levels. I find that the NWC to revenues ratio for NOV is much higher than the industry average (Non-cash WC/Sales) obtained from Damodaran (2023). This suggests that NOV exhibits strong operational efficiency and maintains a sufficient level of

liquid assets to meet their short-term liabilities. Nonetheless, predicting future working capital levels is challenging due to their volatility. Koller et al. (2020) advocate for estimating most items in relation to revenues, implying that working capital typically grows in proportion to revenues. However, they identify certain exceptions, such as inventories and accounts payable, which are linked to input prices and can be estimated as a percentage of COGS. Hence, their recommendations will be adopted in this analysis.

Table 6: The table illustrates NOV's working capital between 2020 and 2022. The numbers are presented in $ million, along with their corresponding percentages of base input (either revenues or COGS) and normalization ratios.

	2020A	2021A	2022E	Ratio
Receivables	2 109	1 980	2 587	
% of revenues	34,6%	35,8%	36,0%	35,5%
Inventories	1 408	1 331	1 740	
% of COGS	24,9%	28,0%	29,2%	27,4%
Operating cash	268	265	344	
% of revenues	4,4%	4,8%	4,8%	4,7%
Operating current assets	**3 785**	**3 576**	**4 671**	
Accounts payable	489	612	868	
% of COGS	8,6%	12,9%	14,6%	12,0%
Accrued liabilities	863	778	966	
% of COGS	15,3%	16,4%	16,2%	16,0%
Contract liabilities	354	392	440	
% of revenues	5,8%	7,1%	6,1%	6,3%
Current portion of lease liabilities	110	99	89	
% of revenues	1,8%	1,8%	1,2%	1,6%
Accrued income taxes	51	24	37	
% of revenues	0,8%	0,4%	0,5%	0,6%
Operating current liabilities	**1 867**	**1 905**	**2 400**	
NWC	**1 918**	**1 671**	**2 270**	
% of revenues	31,5%	30,3%	31,6%	31,1%

Source: (NOV, 2021 & 2022) & Author's own estimates.

8. Cost of Capital

In chapter 3, it was concluded that conducting a fundamental valuation of NOV is the most suitable method for calculating NOV's enterprise value. This method uses the WACC as a discount rate for the free cash flow. As per Damodaran (2012), the firm's value is determined by discounting the expected cash flows, which are attributable to both debt and equity holders, as expressed in the given equation.

$$EV = \sum_{t=1}^{\infty} \left(\frac{FCF_t}{(1+WACC)^t} + \frac{\frac{FCF_n(1+g)}{(WACC-g)}}{(1+WACC)^n} \right)$$

In this formula, "n" refers to the final year of the forecast period, in this case, 2027, while "g" represents the long-term growth rate. The equation's second part represents the terminal value, which is the present value of cash flows generated post-2027. It is critical to ensure that the long-term growth rate does not surpass the overall economic growth rate. This is due to that, over time, companies would become unfeasibly large in relation to the total economy (Koller et al., 2020). This aspect will be examined in greater depth in chapter 10.

Subsequent chapters will examine the methodology for determining the cost of capital and the results obtained for the company. These chapters encompass the methodology and outcomes of the cost of equity calculation, followed by the methodology for the cost of debt calculation. The cost of equity will be calculated using CAPM, and hence, this chapter will also present estimates for the risk-free rate, beta, and market risk premium. Table 7 illustrates the WACC approach calculation.

Table 7: Computed cost of equity and WACC calculation

Cost of equity calculation			**WACC calculation**	
Market premium	4,89%		Cost of debt	5,61%
Risk free rate	3,61%		Cost of equity	9,74%
Unlevered beta	1,19		Debt ratio	16,75%
Levered beta	1,38		Equity ratio	83,25%
Adjusted beta	1,25		Tax rate	21%
Unlevered cost of equity	9,43%		**WACC**	**8,85%**
Levered cost of equity	9,74%			

8.1 Cost of Equity

The cost of equity, symbolized by "r_e", refers to the required rate of return for an equity investment. However, the actual return might diverge from the investor's expectations, thus introducing an element of risk. This risk can be categorized into two types: firm-specific risk that can be mitigated through diversification, and market risk, which remains undiversifiable. When an investor owns equity in a company, they are exposed to a variety of risks. Firm-specific risks, affecting only a limited set of firms, can be diversified away. However, market risks, like macroeconomic factors that impact all investments, cannot be diversified away. Systematic risk or market risk arises from widespread risk sources in the market, and it is characterized by its pervasiveness and resistance to diversification. On the other hand, unsystematic risk, also known as firm-specific risk, emerges from factors unique to a specific firm, and this risk can be mitigated through proper diversification strategies (Brealey et al., 2010) & (Damodaran, 2012).

In the world of finance, there exists a wide range of different risk measurement models. One prominent model is the Fama-French three-factor model, which adjusts for firm size, book-to-market values, and market excess return. This model is primarily applied to market research rather than business valuation, and the most widely adopted risk and return model is the CAPM (Damodaran, 2012). The CAPM is a specialized case of the Arbitrate Pricing Model (APM) and has the advantage of being a simpler model to estimate and use (ibid). However, CAPM relies primarily on historical values and generally, geometric averages provide better estimates of risk premiums in business valuation than arithmetic. The model is grounded in three main underlying assumptions: investors operate in a competitive market, only hold efficient portfolios of traded securities, and share homogenous expectations about securities' volatility, correlations, and expected returns. The CAPM also assumes the absence of transaction costs, universal access to the same information, and the existence of a risk-free asset, enabling investors to keep diversifying without extra costs and borrow and lend at a risk-free rate. In this context, investors maintain different combinations of risky and risk-free assets that reflect their risk preferences (ibid) & (Berk & DeMarzo, 2014).

Despite the underlying assumptions, limitations, and practical issues associated with using CAPM, as discussed earlier, I chose this model to compute NOV's equity cost of capital. This is primarily due to the model's simplicity and widespread use by researchers, analysts, and professionals (Fama, 1991). In addition, the absence of better alternative models is another

factor that has been considered when choosing the appropriate method to compute NOV's equity cost of capital (Hawaldar, 2017). The CAPM is used to calculate the cost of equity in the equation below, which is dependent on the risk-free rate (R_f), the beta representing non-diversifiable risk (β), and the market risk premium (E_r).

$$CAPM = R_f + \beta(E_r - R_f)$$

8.1.1 Risk-free Rate

Certain conditions must be fulfilled for an asset to be classified as risk-free. Firstly, the asset must carry no default risk, a criterion that typically only government securities meet, as they control currency printing. Secondly, the expected return must be certain and equal to the actual return, which implies the absence of both risk of default and reinvestment risks. Also, the bond's duration should ideally match the duration of NOV's future cash flows to the maximum possible extent (Damodaran, 2012). As a result, a 5-year U.S. Government Bond is utilized as a proxy for the risk-free rate. A potential concern is that the U.S. 5-year Treasury may incorporate a liquidity premium and an inflation risk premium, which implies that this proxy is not entirely risk-free. In addition, since I will forecast NOV's future cash flow for the next five years, this will also violate the no reinvestment risk criteria. However, this proxy is considered the nearest substitute available and aligns with the approach outlined by various financial researchers and commonly adopted by the market (Brealey et al., 2012) & (PWC, 2022).

Further, another concern is that the current yield is inverted, and thus shorter-term bonds offer a higher yield than the long-term bonds. Hence, it is not unreasonable to assume that the risk-free rate from the horizon date onwards is somewhat lower than the current risk-free rate. For instance, there is a high probability that the risk-free rate will be around 3% or even less at the beginning of the terminal period, given historical values (Yahoo Finance, 2023). At the same time, one could have accounted for the 10-year U.S. Government Bond, which is at 3,5% (ibid). Since the risk-free rate in the terminal value should reflect the lower level that the risk-free rate is equal to from the horizon onwards, I assume in this analysis a risk-free rate of 3,3% in this period, which is the average between the estimate (3%) and a 10-year U.S. Treasury note (3,5%). Hence, this estimated risk-free rate will in this analysis represent the risk-free long-term nominal interest rate. This estimate is also in line with J.P. Morgan's estimate of a

cycle neutral average yield for a 10-year bond (USD), which is estimated to be 3,2% (J.P. Morgan, 2022).

Given that the beta is calculated based on the prices as of January 17, 2023, it is most logical to employ the values of a U.S. 5-year Treasury note on the same date within the CAPM for consistency's sake. Hence, the risk-free rate to be used in this analysis and to compute the WACC, sourced from Yahoo Finance as of January 17, 2023, is 3,6%.

8.1.2 Beta

We will now move on from the concept of the risk-free asset to focus on assets associated with risk. The introduction of a risky asset into an investor's market portfolio inherently adds a degree of uncertainty, hence risk. If the given asset's movements are independent of the market portfolio, it minimally impacts the overall portfolio risk, as most of its risk is firm-specific and can be mitigated through diversification. However, if the risky asset fluctuates simultaneously with the market portfolio, it contributes more significantly to the market portfolio's risk. This added risk, deemed market or non-diversifiable risk, is quantified by the asset's beta (β_i). Beta is calculated by the ratio of the asset's covariance with the market portfolio (Damodaran, 2012). It provides a relative risk index against the market, which itself carries a beta of 1. Therefore, assets with a beta value greater than 1 are considered riskier than the average market, while those with a beta less than 1 are deemed less risky. A completely risk-free asset would have a beta value of 0, implying no additional risk introduced to the market portfolio (Berk & DeMarzo, 2014) & (Brealey et al., 2010).

Damodaran (2012) presents several methodologies for estimating beta, which is a critical measure of investment risk. One approach is regression on historical data, applicable when the firm has been publicly traded for a considerable duration. This method involves running a regression of the returns on the asset against the returns of a market index, with the slope of the regression defining the beta. Another approach, referred to as the "bottom-up" approach, focuses on the fundamentals of the firm and involves adjusting regression betas derived from comparable firms for leverage to calculate the firm's levered beta.

For the purposes of this analysis, the beta was measured by using NOV's U.S. peers, obtained from Damodaran (2023), to compute an average unlevered and levered beta. This method acknowledges the tendency for stocks within the same industry to converge towards industry averages. The beta was then adjusted according to the Bloomberg method, which involves

multiplying the raw beta by two-thirds and adding one-third. This adjustment accounts for the tendency of betas to converge towards the market beta of 1 (Damodaran, 2012) & (Damodaran, 2023). As a result, the adjusted beta that will be used in this analysis is 1,25.

8.1.3 Market Risk Premium

The Market Risk Premium (MRP) is a critical metric that indicates the additional return investors demand over the risk-free rate for investing in equities as a whole. The MRP is a function of two primary factors: the risk aversion of investors and the perceived risk associated with equity as an investment class.

There are three general methodologies for determining the MRP. The first method involves surveying investors to find out their expected risk premiums, with the MRP being the average of these expectations. However, this approach often results in volatile, short-term estimates due to the lack of constraints on investors' responses.

The second method involves deriving the future market risk premium from historical risk premium estimates. This is also very commonly used in practice. However, this approach is sensitive to the chosen time period, the selected risk-free rate, and whether geometric or arithmetic averages are utilized. It is generally recommended to use long time spans, consistent risk-free rates, and geometric averages.

The third method calculates an implied, forward-looking premium based on current asset prices. This method assumes that stocks are correctly priced overall and that it is possible to measure the cash flows from buying stocks. An internal rate of return can then be calculated and subtracted from the risk-free rate to obtain an implied equity risk premium.

As mentioned, historical risk premiums are commonly used in practice. However, a key issue with this approach is that it measures the differences in yield after the fact (ex post), while analysts need a forward-looking risk premium to discount expected future cash flows (Kinserdal et al., 2019). Hence, I will in this analysis use an alternative approach that considers the implied risk premium, reflecting the need for a forward-looking risk premium (ex-ante). If the market is correctly priced, the implied required return on equity can be extracted using key figures from an index, such as the S&P 500. This required return is then adjusted for the risk-free T-bond rate to obtain the risk premium. This approach has a more dynamic and forward-

looking character to risk premium calculations. As of 1 January, 2023, Damodaran (2023) calculated a risk premium of 4,89% which will be used for the calculation of WACC.

8.2 Cost of Debt

The subsequent discussion will focus solely on the cost of debt, and thus default risk and tax advantage, given that the risk-free rate has already been examined in section 8.1.1. The cost of debt signifies the expected return that lenders anticipate from their investment, incorporating a premium for default risk. Damodaran (2012) indicates that this cost is shaped by the riskless rate, default risk, and the tax advantage tied to debt. As the default risk escalates, the probability of default increases, thereby increasing the firm's risk and consequently, the borrowing cost. The tax rate is also a determinant of the cost of debt, considering that interest expenses are tax-deductible. Functioning as a measure of the firm's expenses associated with borrowing funds for project financing, or alternatively, as the lenders' required return, the cost of debt shares several determining components with the cost of equity. These include the risk-free rate, default or credit risk, and tax advantage. Estimating a firm-specific cost of debt predominantly involves assessing the default risk and translating that risk into a default spread. The tax advantage is estimated utilizing the marginal tax rate, which can potentially introduce complexity (ibid).

Primarily, three strategies can be used to estimate the cost of debt, which include examining recent borrowing history, computing a synthetic rating, and observing the yield of other corporate bonds with a similar rating. Examining recent borrowing history provides an analysis of the firm's latest borrowings to understand the spreads charged, leading to the determination of the cost of debt. Alternatively, a synthetic rating can be estimated based on the firm's interest coverage ratio. This synthetic rating can then be used to compute the default spread, which subsequently aids in measuring the cost of debt (Damodaran, 2012). For NOV, information about their credit rating and associated default spread can be sourced from Moody's (2023) & Damodaran (2023). Therefore, this will be the preferred approach for determining NOV's cost of debt in this analysis. Moody's suggests a credit rating of Baa2 for NOV, which implies a spread of 2% above the risk-free rate (ibid). The resulting cost of debt amounts to 5,6%.

8.2.1 Tax

Taking into consideration the tax savings facilitated by interest expenses, the tax rate that should be used to determine the after-tax cost of debt should be the marginal tax rate. The realization of this interest tax benefit, however, is contingent upon the firm having sufficient income to offset their interest expenses. Damodaran provides three methodologies for managing varying tax rates, of which two will be discussed in greater detail. One method involves utilizing a weighted average of the marginal tax rate in the different areas and regions where NOV conducts business (Damodaran, 2012). That being said, the application of a weighted average of regional nominal tax rates presents challenges as revenue proportions from the operating regions may differ over time, influencing the weights in the analysis. Factors such as the acquisition of licenses in different regions can impact revenues. Moreover, with the disparity in tax rates across countries and the anticipated shifts in several countries due to the enactment of a global minimum tax reform - signed by nations representing 90% of the global economy - this approach is considered less effective, especially given that NOV conducts operations in many of these economies (PWC, 2023) & (WEF, 2021).

Another methodology put forward by Damodaran is that income produced in different regions will ultimately need to be repatriated to the country of origin. This implies that the marginal tax rate should be set at the U.S. rate of 21% (Damodaran, 2012 & (PWC, 2023). This strategy, however, suggests that the tax rate in the home country is below both the average and median of the tax rates in the countries where the business operates. Despite the fact that tax rates in regions such as South America, the Middle East, and Southeast Asia are generally higher than in the U.S., using the U.S. tax rate to project future cash flows is assumed to be appropriate (PWC, 2023). This is also primarily because the purpose of this valuation is to provide a valuation for a diversified U.S. investor. Given this, the after-tax cost of debt yields 4,4%, as computed in the following equation.

$$After - tax\ Cost\ of\ Debt = 5{,}61\%(1 - 21\%) = 4{,}43\%$$

9. Forecasting

This section begins by investigating the NOV's value drivers, drawing from both the OFSE industry market outlook and the strategic analysis. From the strategic analysis of the company, it was found that the reduction in global oil and gas reserves and production capacity due to underinvestment in the sector over the past seven years, coupled with growing energy security risks and increased commodity prices, are likely to persistently stimulate oilfield activity. This, in turn, is expected to drive increased demand for the company's solutions. These assessments, together with the analysis of the financial statements, will serve as the foundation for operating income forecasts. The resulting insights will shape the estimates of future gross profit and EBITDA margin, which is essential in estimating the free cash flow for the fundamental valuation of NOV.

9.1 Estimating Growth

To estimate NOV's revenues in the forecast period, several key factors identified from NOV's strategic and macroeconomic analysis must be considered. Firstly, the strategic analysis revealed historical underinvestment in the oil and gas industry over the past seven years, which has resulted in decreased global inventories and productive capacity. Concurrently, rising energy security risks and higher commodity prices have resulted in increased oilfield activity and demand for NOV's solutions. These market dynamics are expected to contribute to a steadily revenue growth for NOV, particularly in the short-term.

Considering the outlined potential risks and opportunities in the global macroeconomic environment, an in-depth analysis of NOV's value drivers will be critical for accurately forecasting the company's future performance and estimating its intrinsic value. Firstly, climate-related risks must be incorporated into the forecast, as increased environmental concerns can influence NOV's demand. More frequent extreme weather events and increased regulatory scrutiny could impact the OFSE industry by destruction of productive assets and disruptions to basic materials supply. This could be positive for bonds and commodities, especially energy, and real assets, but negative for the stock- and credit markets. Secondly, geopolitical tensions and conflicts, such as the Russia-Ukraine war and uplift in cyberconflict, can affect the global energy markets and supply chains, as well as threatening infrastructure.

This may have potentially lasting trade implications and adds to the uncertainty in the market (J.P. Morgan, 2022).

Further, it is worth considering the downside risk of further weaponization of fuel and food. Recent disruptions in gas supply have spurred governments worldwide to significantly invest in reinforcing supply chains, causing increased volatility of inflation over the long term. Such a development complicates the forecasting of NOV's strategic position and its ability to navigate in the complex market dynamics in the energy sector. On the upside, however, the accelerated adoption of technology, particularly artificial intelligence and drilling automation technologies, can potentially enhance NOV's operational efficiency and productivity. This could positively impact NOV's intrinsic value, real GDP, as well as mitigating some right-tail inflation risks. Moreover, if a stronger than expected investment and capital expenditure cycle occurs, similar to what was witnessed following the pandemic, NOV could benefit from increased demand for its products and services. Although this situation could boost real GDP and limit inflation, the benefits might be more evident in developed than in emerging markets (ibid).

For the first year in the prognosis period, I have estimated a 15% revenue growth rate. This is based on the expected upswing in the oil and gas sector as it recovers from a period of underinvestment and by increased demand for NOV's equipment and technology. It is also in line with consensus estimates, which suggests that NOV's revenues will grow 14,6% in 2023 (Markets Insider, 2023). However, it is important to note that this industry is cyclical in nature, which means that the current phase of higher growth is likely to be followed by a period of slower growth. In addition, this analysis has identified several potential downsides for both the industry and the global economy, which may result in growth rates falling below their current levels.

The long-term growth rate of a single firm's cash flow cannot exceed the overall growth rate of the entire economy. Damodaran (2012) suggests that the long-term growth rate should be set equal to the long-term nominal interest rate, and that the firm has to look like a mature firm at the horizon to maintain consistency in the valuation. Another approach that could be used in the valuation of NOV is to extend the pre-horizon period to 15 years to preserve the pre-horizon behavior (Cooper, 2021). However, as NOV is not a high growth firm per se, I believe that a five-year horizon is appropriate for the valuation of NOV. Hence, in the forecasting of NOV's future cash flows, I will smooth the pre-horizon behavior such that the company make

that transition in a meaningful way (ibid). As such, the growth rate is projected to converge to 3,3% by the end of the five-year horizon, reflecting the risk-free long-term nominal interest rate (Damodaran, 2012).

Moreover, I found from the PESTEL analysis that regulatory and environmental challenges, as well as geopolitical tensions, could potentially hinder growth in the oil and gas sector. Consequently, these factors were also considered in the forecasting of NOV's future cash flows. As the industry moves towards more sustainable practices, the demand for traditional oilfield services and equipment might see a gradual decrease. Hence, the estimates account for these industry changes and potential headwinds that could impact NOV's future revenue growth. However, given NOV's substantial industry experience and highly competent engineers, it can be assumed that the company will adapt to the energy transition and may see an increase in sales within the renewable energy segment. In addition, the company has already adopted several drilling automation and AI technologies, which could further facilitate growth.

In conclusion, while short-term forecasts for revenue growth remain positive, given the cyclical and evolving nature of the oil and gas industry, a conservative approach was adopted with revenue growth rates converging linearly over the five-year forecast horizon to 3,3%, which is equal to the risk-free long-term nominal interest rate. This accounts for both the opportunities, e.g., the current underinvestment in the industry, as well as the potential challenges that may arise due to geopolitical, regulatory, and environmental factors.

9.2 Estimating Margins

Estimating NOV's future margins is an essential aspect of this forecasting analysis, as margins are a fundamental metric of profitability and can provide insight into the operational efficiency of a company. Margins are also important when forecasting NOV's ability to generate cash flows and returns on investments, making them a key element in the valuation of NOV. When examining the gross profit margin, I will essentially look at how effectively NOV is managing its cost of goods sold in relation to its revenues.

To begin with, the gross profit margin at the horizon is estimated to be 11,8%. This estimate is obtained from Damodaran's industry averages, implying that the gross profit margin will be in line with the broader OFSE industry average. Given that NOV is a leader in the OFSE industry, one could argue that the company may remain at the current level at 17,3%. However,

this estimate also assumes that NOV will effectively manage cost drivers such as the cost of raw materials and production efficiency and achieving industry-average margins appears feasible. In the forecast period, although both revenues and COGS are expected to grow, the growth rate of COGS is slightly higher than the revenue growth rate. This will result in a slight decrease in the gross profit margin over the forecast period, indicating that the cost efficiency may not be improving at the same rate as the revenue growth. Hence, I assume that NOV's gross profit margin will converge linearly from the current level to Damodaran's industry averages, and thus equal 11,8% at the horizon (Damodaran, 2023).

Operating expenses are another component when estimating margins. These expenses, which primarily includes selling, general, and administrative expenses, are subtracted from gross profit to arrive at EBITDA. The ratio of EBITDA to revenue gives us EBITDA margin. EBITDA margin provides a more direct measure of NOV's operational profitability by excluding the impact of non-operating expenses such as interest, taxes, depreciation, and amortization. Achieving an EBITDA margin that aligns with the industry average would demonstrate NOV's ability to maintain profitability on an operational level, despite any potential fluctuations in financial, tax, and capital expenses.

As NOV's current EBITDA margin at 6,1% is higher than previous years and above industry averages, it can be reasonable to assume that maintaining the current level over the long term might be challenging. In addition, given the cyclical nature of the industry, which recently experienced a downward trend due to a drop in oil prices at the end of 2022 following a period of record high prices, a continued high EBITDA margin might not be appropriate to expect. In addition, it should be emphasized that these margin estimates are contingent upon a variety of factors, such as commodity prices and complex market conditions. Moreover, potential disruptions in supply chains, geopolitical tensions, and shifts in energy policies, which have been previously examined in this analysis, could significantly affect NOV's ability to maintain the current margins. NOV's estimated operating expenses are expected to grow initially and then decrease towards the end of the forecast period. Hence, the EBITDA margin at the horizon is assumed to equal 3,6%, in line with Damodaran's industry averages (Damodaran, 2023). However, as the findings from the industry and company analyses for NOV suggest that the oil and gas industry is expected to experience increased oilfield activity and thus increased demand for OFSE solutions, I would expect an increase in EBITDA until 2025, before it declines in both 2026 and 2027.

9.3 Estimating Investments and Working Capital

Estimating investments and working capital requirements for NOV is a key factor in the forecasting of NOV. The level of investments determines the company's capacity to expand and improve its operations, while the working capital requirements provide insight into the firm's short-term liquidity position. NOV's investment relative to its revenue is indicative of the amount NOV is reinvesting in its business to support its growth and maintain its competitive edge in the OFSE industry. Given the constant need for research, development, and innovation of new technologies in this industry, maintaining a healthy CAPEX to revenue ratio is crucial for NOV's continued growth and success. As previously discussed, NOV's current (2022E) CAPEX to revenue ratio is at 2,8%, while the industry average obtained from Damodaran (2023) is equal to 0,3% (Damodaran, 2023). CAPEX to revenue ratio at the horizon is estimated to be 1,6%. This figure is derived from the average of the 2022E ratio and Damodaran's industry averages. To smooth the pre-horizon behavior of the firm, I assume that the CAPEX to revenue ratio will converge linearly from the current level to 1,6% by the end of the five-year horizon (Cooper, 2021).

Moreover, the CAPEX to depreciation ratio at the horizon is estimated to equal 83,01%, which is based on the average of the 2022E ratio (75,3%) and Damodaran's industry averages (90,7%) (Damodaran, 2023). This ratio provides an indication of the extent to which NOV is investing to maintain or expand its asset base after accounting for depreciation. A ratio above 100% implies that NOV is investing more than it is depreciating, signifying expansion. On the other hand, the NWC to revenue ratio at the horizon is estimated to be 18,2%, a figure computed by averaging the 2022E ratio (18,2%) and Damodaran's industry averages (5,3%). This ratio provides an understanding of how much working capital NOV requires to generate revenue. It indicates the company's efficiency in managing its short-term assets and liabilities. Both the CAPEX to depreciation ratio and the NWC to revenue ratio are expected to converge from the current level to the horizon. Hence, it is worth noting that these estimates assume that NOV's future performance will align with its recent past and industry averages, and that changes in market conditions, economic factors, or company-specific factors could impact these assumptions substantially.

9.4 Assumptions Summarized

The free cash flow at the horizon is contingent upon factors such as the level of revenue, the gross profit margin, and the required reinvestment of cash for business operations. In conclusion, the following assumptions are used in this valuation of NOV:

1. The horizon is five years;

2. The growth rate (g) is set equal to the risk-free long-term nominal interest rate, which is estimated to equal 3,3%;

3. The horizon free cash flow is set using the following assumptions:

- The first year's revenue growth is set at a growth rate of 15%, after which it linearly declines to reach 3,3% by the end of the horizon;
- The Gross profit margin at the horizon is projected to be 11,8%, which corresponds with Damodaran's industry averages;
- The EBITDA margin at the horizon is estimated to equal 3,6%, again aligning with Damodaran's industry averages;
- The tax rate is expected to remain consistent with the current U.S. corporate tax rate of 21%, across all years and up to the horizon;
- The cost of capital is set equal to the WACC computed in section 8 and assumed to remain constant across all years and up to the horizon;
- CAPEX to Revenue ratio at the horizon is estimated to be 1,6%, a figure derived from the average of the 2022E ratio and Damodaran's industry averages;
- The CAPEX to Depreciation ratio at the horizon is projected to equal 83%. This is based on the average of the 2022E ratio and Damodaran's industry averages;
- The NWC to Revenue ratio at the horizon is estimated to be 18,2%, a figure computed by averaging the 2022E ratio and Damodaran's industry averages.

The FCFF for NOV during the forecast period is illustrated in table 8 and presents an outlook on the company's financial performance. Beginning with the revenue estimates, a positive growth rate is expected for the company over the forecast period. Revenues are estimated to increase from $8,274 million in 2023 to $11,097 million in 2027. This revenue growth

highlights an overall increasing trend in the firm's earning potential, signaling potential opportunities for growth and expansion through investments. In terms of COGS, an increase is expected over the forecast period, growing from $6,936 million in 2023 to $9,785 million in 2027. Despite this increase, the growth rate of COGS is consistent with growth in revenues, and the company maintains a relatively stable gross profit margin throughout the period. Gross profit is also projected to grow over the years, albeit at a slower pace compared to revenue and COGS, increasing from $1,338 million in 2023 to $1,313 million in 2027. This slower growth rate is primarily due to the increasing COGS outpacing the revenue growth rate.

Table 8: FCFF calculations for NOV in the forecast period.

	2023F	2024F	2025F	2026F	2027F
Revenues	8 274	9 272	10 119	10 746	11 097
COGS	6 936	7 873	8 702	9 358	9 785
Gross Profit	1 338	1 399	1 417	1 388	1 313
Operating expenses	974	1 009	1 010	977	910
EBITDA	364	390	406	411	403
Depreciation and amortization	279	276	263	240	210

Source: Author's own estimates

Operating expenses are estimated to increase in the initial years before showing a decline towards the end of the forecast period. The expenses grow from $974 million in 2023 to $1,010 million in 2025, and then decrease to $910 million in 2027. This could be attributed to the expected efforts for cost optimization and efficiency improvements over time. EBITDA present a steady growth pattern, rising from $364 million in 2023 to $403 million in 2027. This upward trend indicates NOV's potential to generate profit before considering non-operational expenses. Finally, depreciation and amortization expenses are expected to decrease over the forecast period from $279 million in 2023 to $210 million in 2027. This decline is attributed to the aging of the company's asset base over the forecast period.

10. Valuation Models

This analysis has conducted a strategic and financial statement analysis, laying the groundwork for the assumptions that form the basis of the cash flow projections used in the WACC method. Future levels of revenue, gross profit margins, and the required reinvestments in operations have been estimated, facilitating the calculation of free cash flows that should represent NOV's core operations during the forecast period. In addition, the risk associated with NOV's capital structure has been evaluated to determine a proper discount rate. This section outlines the estimated stock price for NOV, as deduced through the fundamental valuation analysis using the WACC method. Following the WACC approach, the DCF analysis will be supported by a sensitivity analysis based on changes in the WACC and the growth rate at horizon. A relative valuation, where NOV's value is compared to that of its peers, will also be conducted. This will ultimately lead to the final conclusions regarding the findings.

10.1 DCF Analysis

10.1.1 WACC Method

The projected FCFF for NOV, as illustrated in Table 9, remains positive throughout the forecast period, and is estimated to reach $402 million by 2027. NOV's growth is estimated to persist during the forecast period, albeit at a decreasing rate as the growth rate is assumed to converge linearly to industry averages. This growth necessitates continued investments in both CAPEX and operating working capital. CAPEX growth is forecasted to slow down by 2025, as it is expected to converge with industry benchmarks, a level that is currently below the current CAPEX-to-sales ratio. In addition, the NWC is estimated to decrease annually over the forecast period, aligning with the assumption that the company's NWC will linearly converge with industry averages (Damodaran, 2012).

Table 9: FCFF calculations for NOV in the forecast period.

	2023F	2024F	2025F	2026F	2027F
EBIT	85	114	143	170	193
Tax	21%	21%	21%	21%	21%
EBIT (1-Tax)	67	90	113	135	153
+ Depreciation and amortization	279	276	263	240	210
- CAPEX	214	216	210	196	174
- Δ NWC	122	45	-42	-131	-214
FCFF	**10**	**105**	**208**	**310**	**402**

Source: Author's own estimates

In the process of estimating NOV's share price, the terminal value for long-term growth, i.e., from the horizon date onwards, needs to be computed. This terminal value relies on the assumption that the long-term growth will be constant forever and that it is appropriate to use a constant discount factor. In addition, it will rely on the assumption that NOV will look like a mature firm, i.e., reaching a steady state by the horizon date, and therefore symbolizes the market value of the FCFF from the horizon onwards (Berk & DeMarzo, 2014). As suggested by Damodaran (2012), the terminal growth rate should be equivalent to the expected risk-free long-term growth of the economy. Kinserdal et al. (2019) suggests that the growth rate from the horizon date onwards should not be higher than the expected real economic growth. Hence, the terminal growth rate in this analysis is estimated to equal 3,3%, as computed in 9.1.1.

Table 10 illustrates the findings from the final stage of the DCF model. To compute NOV's enterprise value, the estimated FCFF and terminal value are discounted using the calculated WACC of 8,9%. Subsequently, the net financing debt, previously computed in section 7.6, is deducted to obtain the equity value attributable to shareholders. The final step in this process involves dividing the value of equity by the number of shares outstanding, which thereby yields the estimated share price of $11,6.

Table 10: Calculation of NOV's estimated share price.

	2023F	2024F	2025F	2026F	2027F
FCFF	**10**	**105**	**208**	**310**	**402**
Terminal Value					7 446
Sum of CF	**10**	**105**	**208**	**310**	**7 848**
Discount factor	*0,9187*	*0,8440*	*0,7754*	*0,7124*	*0,6545*
Discounted CF	**9**	**88**	**161**	**221**	**5 137**
Enterprise Value	**5 616**				
Net financing debt	1 081				
Value of equity	**4 536**				
Shares outstanding	392,8				
Share price	**11,55**				

Source: Author's own estimates

From the DCF analysis, I find that an estimated share price of $11,6 is appropriate based on the assumptions made in this valuation. The estimated share price is significantly lower than both the current share price and the target price of $24, which is backed up by a buy recommendation from Morgan Stanley (Markets Insider, 2023). Hence, it is crucial to note that this estimate might not necessarily constitute the optimal valuation of NOV. I have earlier highlighted the cyclical nature of the industry, which presents a significant challenge when valuing NOV. Moreover, a longer forecast period tends to introduce more uncertainty into the model, subsequently affecting the estimates of NOV's valuation. The findings reveal that over 90% of the enterprise value is derived from the discounted FCFF from the horizon date onwards. Consequently, even relatively minor changes to the growth rate from the horizon onwards or the WACC can have a great impact on the valuation of NOV. The following section will elaborate on the uncertainty reflected in these results by performing a sensitivity analysis.

10.1.2 Sensitivity Analysis

This chapter conducts a sensitivity analysis of the share price estimated from the crucial assumptions employed in the fundamental analysis of NOV. The objective is to evaluate the degree of variability, and thus uncertainty, in the stock price in response to changes in the main

operational assumptions that exert the most substantial influence on NOV's value. It is imperative to acknowledge that both fundamental valuation and market-based valuation heavily rely on numerous assumptions, resulting in great uncertainty in the valuation estimate. Consequently, it becomes crucial to analyze the sensitivity of the estimated value to fluctuations in the key factors that drive its intrinsic value. These factors include the terminal value, growth rate at horizon (g), and WACC.

A sensitivity analysis is performed concerning the growth rate at the horizon and WACC, as shown in table 11. I find that the sensitivity of the share price to fluctuations in the WACC is the most critical factor affecting the company's stock price. This analysis illustrates that even an increase in the horizon growth rate by two-percentage points (pp) or a decrease in the WACC by the same margin still places NOV's estimated share price below its current stock price. Hence, this analysis exploits the sensitivity of the stock price due to relatively small changes in both the WACC and the horizon growth rate. The results from this analysis support the findings from the fundamental valuation, suggesting that NOV is likely overvalued.

Table 11: Assessment of NOV's stock price sensitivity to WACC and growth rate (g) at horizon.

Sensitivity Analysis		g at horizon						
		-2,0%	-1,0%	-0,5%	0,0%	0,5%	1,0%	2,0%
WACC	-2,0%	12,31	15,51	17,70	**20,50**	24,21	29,36	49,43
	-1,0%	9,75	11,92	13,33	**15,04**	17,17	19,90	28,53
	-0,5%	8,74	10,57	11,73	**13,12**	14,81	16,92	23,18
	0,0%	**7,87**	**9,43**	**10,40**	**11,55**	**12,92**	**14,59**	**19,33**
	0,5%	7,11	8,45	9,28	**10,24**	11,37	12,72	16,42
	1,0%	6,44	7,61	8,31	**9,13**	10,07	11,19	14,15
	2,0%	5,31	6,21	6,75	**7,35**	8,04	8,83	10,84

Source: Author's own estimates

The analysis reveals that the share price is highly sensitive to fluctuations in the WACC, making it the most influential factor affecting the company's stock price. This finding raises important questions about the applicability of the approach, particularly considering the

substantial contribution of the terminal value to the overall equity valuation. Hence, one would want to isolate the effects on the terminal value due to changes in g and the WACC.

The sensitivity analysis conducted on the terminal value derived from the fundamental valuation of NOV is exhibited in table 12 and provides crucial insights into the impact of changes in the WACC. The WACC calculated for NOV is 8,9%, and the corresponding terminal value stands at $7,446 billion. However, this value is quite sensitive to changes in the WACC, indicating a certain level of uncertainty in the estimates. For instance, a one-pp decrease in the WACC would lead to a considerable increase in the terminal value to $9,072 billion. Conversely, a one-pp increase in the WACC results in a decrease in the terminal value to $6,314 billion. A two-pp increase in the WACC leads to a further drop in the terminal value to $5,481 billion. However, a change by as much as two-pp seems rather unlikely based on current market outlooks and forward rates. Even a relatively modest half-pp change in either direction leads to a noticeable impact on the terminal value, with an increase to $8,179 billion for a decrease in WACC, and a decrease to $6,834 billion for an increase in WACC. An even smaller change by 0,1% in either direction results in more than a $130 million reduction/increase in the terminal value.

Table 12: Assessment of NOV's terminal value sensitivity to the WACC.

Sensitivity Analysis		
		Terminal Value
	-2,0%	11 606
	-1,0%	9 072
	-0,5%	8 179
	-0,3%	7 869
	-0,1%	7 582
WACC	0,0%	**7 446**
	0,1%	7 315
	0,3%	7 066
	0,5%	6 834
	1,0%	6 314
	2,0%	5 481

Source: Author's own estimates

Finally, a sensitivity analysis is performed on the long-term growth rate, as shown in table 13 shows. The analysis reveals that the long-term growth rate is the most significant driver of the

terminal value. The assumed growth rate at the horizon and onwards of 3,3% is relatively conservative, considering the prospects for renewable energy sources and advancements in drilling automation technology. By adopting the conservative approach regarding the long-term growth rate, the potential impact of an incorrect estimate can be reduced. As illustrated in Table 13, a one-pp decrease in the anticipated long-term growth rate would result in a reduction of $1,261 billion in the terminal value. This corresponds to a 17% decrease from the terminal value estimated using the fundamental valuation approach.

Table 13: Assessment of NOV's terminal value sensitivity to growth rate (g) at horizon

Sensitivity Analysis	g at horizon										
	-2,0%	-1,0%	-0,5%	-0,3%	-0,1%	0,0%	0,1%	0,3%	0,5%	1,0%	2,0%
Terminal Value	5 258	6 185	6 763	7 022	7 300	**7 446**	7 598	7 918	8 264	9 261	12 096

Source: Author's own estimates

Notably, the terminal value ranges from $5,258 billion with a two-pp decrease in g, to $12,096 billion with a two-pp increase in g. It is also worth mentioning that even a small 0,1-pp increase in the growth rate results in a slightly higher terminal value of $7,598 billion, compared to the estimated $7,446 billion at the base growth rate of 3,3%. Similarly, a 0,1-pp decrease leads to a marginally lower terminal value of $7,300 billion. The results of this sensitivity analysis highlight the pivotal role that the assumed growth rate plays in this valuation model. It also points to the need for an in-depth analysis of both external and internal factors of the company that could potentially impact these key growth drivers. Hence, while the fundamental valuation provides a reasonable estimate of NOV's value, the wide range of potential terminal values resulting from plausible changes in the growth rate should be considered.

These findings indicate the significance of the terminal value, g, and WACC in valuation, and emphasize the need for accuracy and in its estimation. I find that the estimates from the fundamental valuation are fairly sensitive to small changes in important value drivers, particularly the growth rate at horizon. Given the substantial sensitivity of the terminal value to changes in the g and the WACC, any inaccuracies in these estimates, or "wrong" underlying assumptions, could introduce substantial errors into the valuation of NOV. This could potentially serve as a misleading basis for the forecasts, and thus affect investment decisions. Hence, while this analysis provides a reasonable foundation for NOV's valuation, it is

important to note the profound uncertainty in the final estimated value and share price of the firm.

10.2 Multiples Approach

The following section seeks to calculate the value of NOV by applying relative valuation. This process involves comparing NOV's value to those of similar companies in the same industry. As outlined in Section 3.2, this methodology relies on the assumption that, on average, the market prices stocks accurately. This approach relies on the identification of comparable firms and their respective multiples for accurate comparison. The peer group, as outlined in section 2.3, comprises companies within the oilfield services and equipment industry that share similar exposure to market risks as NOV. These companies are Baker Hughes, Halliburton, and Schlumberger.

The most frequently used valuation multiples include price (P) and enterprise value (EV) (Mauboussin & Callahan, 2021). Enterprise value is probably the best metric for comparison among firms with varying debt ratios, given that it embodies the aggregate value of a firm's underlying operations. In contrast, the price only consider the market value of equity. As NOV's peers have differences in their levels of leverage and have reported positive EBITDA, EV/EBITDA is probably the most suitable multiple in this context. Price/Earnings (P/E) is the most used price multiple (ibid). However, since Baker Hughes has reported negative earnings, I will use the Price/Sales (P/S) multiple. In conclusion, I will in this relative valuation approach use two multiples, namely EV/EBITDA and P/S, respectively.

Multiples can be measured in several ways, one of which is TTM multiples. TTM multiples use data from the most recent 12-month period to assess a company's value, in this case, up to the third quarter of 2022. Revenues and EBITDA are obtained using the TTM method, while market capitalization and stock prices are obtained as of 17th January 2023, maintaining consistency in the relative valuation by applying the same method across the peer analysis.

Based on the EV/EBITDA multiple conducted in table 14, as of 17th January 2023, NOV trades at a substantially higher multiple than all of its peers. This suggests that NOV's stock is potentially overvalued. However, NOV's growth projections could be a significant factor in leading to this result. When computing the average EV/EBITDA multiples among the

company's peers and using the estimate for NOV's EBITDA in 2022, the implied share price for NOV yields $14,6. Hence, this approach suggests that NOV's stock is overvalued, given that it is traded at $23,51on 17 January, 2023.

Table 14: Relative valuation of NOV (EV/EBITDA multiple from its peers)

Relative Valuation	NOV	Baker Hughes	Halliburton	Schlumberger
Market Cap	9 240	31 790	38 450	83 360
Enterprise Value	9 958	35 970	43 970	92 660
EBITDA	387	2 176	3 216	5 822
EV/EBITDA	**25,73**	**16,53**	**13,67**	**15,92**
Average	**15,37**			
Median	15,92			
EBITDA 2022E	442			
Implied EV	**6 796**			
Net financing debt	1 081			
Value of equity	**5 716**			
Shares oustanding	392,8			
Share Price	**14,55**			

Source: (YCharts, 2023)

The P/S approach, as exhibited in Table 15, generates a notably different outcome compared to the results from the EV/EBITDA approach. NOV trades at a lower P/S multiple than its peers. This different trading multiples might be primarily due to the P/S multiple's insensitivity towards leverage considerations. Hence, when conducting a relative valuation of NOV using the P/S multiple, NOV's share price yields $41.

Table 15: Relative valuation of NOV (P/S multiple from its peers)

Relative Valuation	NOV	Baker Hughes	Halliburton	Schlumberger
Market Cap	9 240	31 790	38 450	83 360
Revenues	6 681	20 736	18 992	26 437
P/S	**1,38**	**1,53**	**2,02**	**3,15**
Average	**2,24**			
Median	2,02			
NOV 2022E Revenues	7 194			
Implied value of equity	**16 093**			
Shares oustanding	392,8			
Share Price	**40,97**			

Source: (YCharts, 2023)

10.3 Valuation Summary

Both the fundamental and relative valuation approaches indicate that NOV's stock is priced incorrectly in the current market, suggesting that the firm's stock is overvalued. It is imperative to note, however, that substantial uncertainty accompanies both methods. Given that over 90% of the value is attributed to the terminal value, even minor adjustments to the WACC or terminal growth rate could have a substantial impact on the estimated share price. The relative valuation yields a somewhat higher estimate compared to the fundamental valuation, yet it is still considerably lower than the present market share price. I chose the EV metric as a preferred measure considering the differing financial leverage and earnings among the peers. The EV/EBITDA multiple resulted in a higher share price than from the fundamental valuation, potentially reflecting greater growth prospects for the peers than assumed for NOV. Despite these differences, the relative valuation supports the results from the fundamental valuation and the selected peer group is likely representative of the market's perception of NOV. For the final target share price, I choose to give the estimate from the fundamental valuation ($11,6) a weight of 70% and the estimate from the multiples approach ($14,6) a weight of 30%. This yields a final price target of $12,5 for NOV's stock.

11. Conclusion

In this thesis I have estimated the fair value of NOV's share price by conducting a fundamental valuation of the company. To support this approach, I have performed a relative valuation based on multiples, particularly the EV/EBITDA multiple. In order to accompany the assumptions necessary for the fundamental valuation analysis, I conducted thorough investigations of both macroeconomic and industry-specific aspects that influence the OFSE industry. Moreover, I examined firm-specific aspects to establish NOV's competitive position. This will ultimately influence their capacity to generate cash flows, which will form the basis for a fundamental analysis of the company.

There are several findings from the macroeconomic analysis that indicate promising economic conditions for NOV. Firstly, following an extended period of lower investments, upstream oil and gas expenditures are projected to rise, resulting in an increase in OFSE demand. Secondly, higher oil and gas prices are likely to stimulate exploration and production activities, which will further boost investment activity and enhance value within the sector. However, given the cyclical nature of the industry NOV's growth prospects are subject to several potential downsides. For instance, the global economic outlook has weakened amid high inflation and interest rates, which could inhibit growth. The current inflationary situation is closely associated with stimulus packages enacted by governments in response to the pandemic and is further worsened by the ongoing geopolitical conflict between Russia and Ukraine.

Further, the rivalry in the OFSE industry is characterized as moderate. Operating in the OFSE industry often requires various licenses, permits, and certifications from governments, which can be expensive and time-consuming. New entrants may face challenges in these processes, as well as securing the necessary approvals in order to operate and ensure compliance with laws and regulations. As NOV is one of the first movers in the industry, the company has maintained a strong position as one of the market leaders the last decades. However, due to the intricacy of its organizational structure can lead to communication barriers, delays in decision-making, and an inefficient allocation of resources may arise. In addition, NOV's primary focus on the upstream oil and gas sector restricts its diversification, leaving it vulnerable to risks associated with market downturns or declining demand for oil and gas services. However, NOV could invest more in alternative energy sources, such as renewables

or downstream services, which would help diversify its revenue streams and reduce its vulnerability to different market dynamics in the oil and gas industry.

After I locked the inputs, as of May 16, 2023, NOV's stock is trading at $14,57. This aligns with the results derived from the relative valuation, although it remains higher than both the relatively conservative estimate from the fundamental valuation and the final price target. It is worth noting that the 2022 estimates were fairly accurate. However, both a lower EBITDA and gross profit margin were expected. The estimates stood at 6,1% and 17,3% respectively, as opposed to the actual figures of 7,8% and 18,4%.

From the fundamental valuation, the estimated fair value of NOV's share is estimated to be $11,6, while the relative valuation approach suggests a share price of $14,6. Both of these estimates stand below the current share price at $23,51. The estimation relies on a number of assumptions, and a relatively conservative approach has been adopted to reduce downside risk associated with the valuation. A sensitivity analysis of the terminal value drivers indicates substantial variation in the share price due to changes in key inputs, particularly the growth rate from the horizon onwards. This is largely due to over 90% of NOV's enterprise value being derived from the terminal value.

Based on these findings, it appears that the current market sentiment may be overvaluing NOV's stock. The final price target of NOV's stock is $12,5, which is adjusted based on the derived estimates from both the fundamental and relative valuation methods, with a 70/30 weight respectively. Given the projected growth derived from this analysis of NOV's forecasts, the resultant final price target falls below the current market price. This represents a potential downside of approximately 44% to the current share price. These results strengthen the conclusion that NOV's stock is trading at a premium relative to its fair value, and it supports the validity of a sell recommendation.

Bibliography

Accenture. (2020). *Halliburton Teams with Accenture to Accelerate Digital Supply Chain Transformation*. Accenture Newsroom. Retrieved from:

https://newsroom.accenture.com/news/halliburton-teams-with-accenture-to-accelerate-digital-supply-chain-transformation.htm

Aker BP. (2022). *Konsekvensutredning for utbygging og drift av petroleumsforekomster omfattet av NOA Fulla*. Retrieved from:

https://akerbp.com/wp-content/uploads/2022/06/noa-fulla-konsekvensutredning.pdf

Alterman, J. (2023). The Middle East's Economic Outlook. CSIS. Retrieved from:

https://www.csis.org/analysis/middle-easts-economic-outlook

Ati, N., Brinkman, M., Peacock, R., & Wood, C. (2016). Margins under pressure as market falls further. Retrieved from:

https://www.mckinsey.com/industries/oil-and-gas/our-insights/margins-under-pressure-as-market-falls-further

Ati, N., Kostadinov, D., Nelissen, D., & Spandan. (2021). *Strategies for OFSE companies confronting the energy transition*. McKinsey & Company. Retrieved from:

https://www.mckinsey.com/industries/oil-and-gas/our-insights/strategies-for-ofse-companies-confronting-the-energy-transition

Baker Hughes. (2020). *Energy Forwards*. Baker Hughes ANNUAL MEETING 2020. Retrieved from:

https://www.bakerhughes.com/energy-forward-keynote

Baker Hughes. (2023). *About Us*. Retrieved from:

https://www.bakerhughes.com/company/about-us

Baker Hughes. (2023). *Baker Hughes Forms Strategic Digital Collaboration with Corva to Enhance Customer Well Construction Efficiency*. Baker Hughes Tech News. Retrieved from:

https://www.bakerhughes.com/company/news/baker-hughes-forms-strategic-digital-collaboration-corva-enhance-customer-well

Baker Hughes. (2023). *Baker Hughes Signs Strategic Collaboration Agreement with Amazon Web Services, Inc. to Deliver the LeucipaTM Automated Field Production Solutions*. Baker Hughes Tech News. Retrieved from:

https://www.bakerhughes.com/company/news/baker-hughes-signs-strategic-collaboration-agreement-amazon-web-services-inc-deliver

Baker Hughes. (2023). *International Rig Count*. Retrieved from:

https://rigcount.bakerhughes.com/intl-rig-count

Baker Hughes. (2023). *NovaLT™ Gas Turbines*. Baker Hughes NovaLT Technology. Retrieved from:

https://www.bakerhughes.com/gas-turbines/novalt-technology

BakerHughesC3.ai. (2023). *Introducing BakerHughesC3.ai.* BakerHughesC3.ai About Us. Retrieved from:

https://bakerhughesc3.ai/company/

Berk, J., & DeMarzo, P. (2014). *Corporate Finance*. Boston: Pearson Education Inc.

Brealey et al. (2010). *Principles of corporate finance*. (10th ed.). Mc Graw Hill.

BVR. (2017). *What It's Worth: Valuing Oil, Gas, and Alternative Energy Assets (2nd ed.)*. Business Valuation Resources, LLC. Retrieved from:

https://www.bvresources.com/products/what-its-worth-valuing-oil-gas-and-alternative-energy-assets-second-edition

Cooper, I.A. (2021. *Using the constant growth formula to set the horizon value in corporate valuation: The case of growth firms and why you need a longer horizon*. London Business School. SSRN.4094896. Retrieved from:

https://dx.doi.org/10.2139/ssrn.4094896

CSIMarket. (2023). *Asset Turnover Ratio Screening as of Q4 of 2022*. Retrieved from:

https://csimarket.com/screening/index.php?s=at&pageS=2&fis=

Damodaran, A. (2005). *FCFF Valuation Models: Growth in FCFE Versus growth in FCFF*. Stern School of Business Retrieved from:

http://pages.stern.nyu.edu/~adamodar/New_Home_Page/lectures/fcff.html

Damodaran, A. (2006). *Valuation Approaches and Metrics: A Survey of the Theory and Evidence.* Stern School of Business. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/pdfiles/papers/valuesurvey.pdf

Damodaran, A. (2007). *Equity Risk Premiums: Looking backwards and forwards...* Damodaran Online. Retrieved from:

http://people.stern.nyu.edu/adamodar/pdfiles/country/ERP.pdf

Damodaran, A. (2012). *Investment Valuation (3rd ed.)*. Wiley Finance.

Damodaran, A. (2017). *An Introduction to Valuation*. Stern School of Business. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/pdfiles/eqnotes/ValIntrospr17.pdf

Damodaran, A. (2023). *Betas by Sector (US).* Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html

Damodaran, A. (2023). *Big-picture valuation spreadsheets: All-in-one Valuation Models*. Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/spreadsh.htm

Damodaran, A. (2023). Capital Expenditures by Sector (US). Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/capex.html

Damodaran, A. (2023). *Debt ratios and Fundamentals*. Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/dbtfund.htm

Damodaran, A. (2023). *Enterprise Value Multiples by Sector (US)*. Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/vebitda.html

Damodaran, A. (2023). *Implied ERP by month for previous months*. Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/

Damodaran, A. (2023). *Margins by Sector (US)*. Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/margin.html

Damodaran, A. (2023). *Revenue Multiples by Sector (US)*. Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/psdata.html

Damodaran, A. (2023). *Working Capital Ratios by Sector (US)*. Damodaran Online. Retrieved from:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/wcdata.html

Deloitte. (2017). *Protecting the connected barrels: Cybersecurity for upstream oil and gas*. Deloitte Center for Energy Solutions. Retrieved from:

https://www2.deloitte.com/de/de/pages/energy-and-resources/articles/protecting-the-connected-barrels.html

Deloitte. (2022). 2023 *oil and gas industry outlook*. Retrieved from:

https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-2023-outlook-oil-and-gas.pdf

Deloitte Insights. (2022). *Striking the balance*. Retrieved from:

https://www2.deloitte.com/content/dam/insights/articles/us175667_er-i_striking-the-balance/GLOB175667_Striking%20a%20balance_MASTER_accessible.pdf

Deloitte. (2023). *Latin America economic outlook, January 2023*. Retrieved from:

https://www2.deloitte.com/xe/en/insights/economy/americas/latin-america-economic-outlook.html

DNV. (2023). *Energy Transition Outlook 2022*. Retrieved from:

https://www.dnv.com/energy-transition-outlook/download.html

Economist Intelligence Unit (EIU). (2022). *Middle East: uneven post-covid recovery*. Retrieved from:

https://www.eiu.com/n/middle-east-uneven-post-covid-recovery/

EIA. (2023). *Crude oil and natural gas drilling activity*. Retrieved from:

https://www.eia.gov/dnav/pet/pet_crd_drill_s1_m.htm

Elsight. (2023). *Drones in Oil & Gas*. Retrieved from:

https://www.elsight.com/use-case/drones-in-oil-and-gas/

Essien, A.E., White, K., & Mohammadi, M. (2022). *Interrelationship study of the impacts of hydraulic fracturing on the environment and socioeconomic activities: a novel approach to finding sustainable solutions*. Environ. Sci.: Adv., 2022,1, 305-319. Retrieved from:

https://doi.org/10.1039/D2VA00023G

EY. (2023). Applying AI in Oil and Gas. Retrieved from:

https://www.ey.com/en_lb/applying-ai-in-oil-and-gas

Fama, Eugene F. (1991). *Efficient Capital Markets*. Journal of Finance 46(5), 1575-1617.

Gleißner et al. (2022). *Financial sustainability: measurement and empirical evidence*. J Bus Econ 92, 467–516. Retrieved from:

https://doi.org/10.1007/s11573-022-01081-0

Goldman Sachs. (2023). *2023 Outlook, Caution: Heavy Fog*. Goldman Sachs Investment Strategy Group. Retrieved from:

https://www.gsam.com/content/dam/pwm/direct-links/us/en/PDF/2023-isg-outlook.pdf

Gürel, E. (2017). *SWOT ANALYSIS: A THEORETICAL REVIEW*. Journal of International Social Research 10(51):994-1006. Retrieved from:

http://dx.doi.org/10.17719/jisr.2017.1832

Halliburton. (2022). *Halliburton and Aker BP Collaborate to Develop Next Generation Field Development Planning.* Halliburton News and Press Releases. Retrieved from:

https://www.halliburton.com/en/about-us/press-release/halliburton-aker-bp-collaborate-develop-next-generation-field-development-planning

Halliburton. (2022). *Halliburton Introduces Innovative Technologies, Sustainable Solutions at ADIPEC*. Halliburton News and Press Releases. Retrieved from:

https://www.halliburton.com/en/about-us/press-release/halliburton-introduces-innovative-technologies-sustainable-solutions-at-adipec

Halliburton. (2023). *Why Halliburton?* Halliburton Investor Relations. Retrieved from:

https://ir.halliburton.com

Handley, K., & Limão, N. (2022). *Trade Policy Uncertainty*. Annual Review of Economics. Retrieved from:

https://doi.org/10.1146/annurev-economics-021622-020416

Hawaldar, I.T. (2011). RELEVANCE OF CAPITAL ASSET PRICING MODEL - A REVIEW. JBFSIR, Volume 1, Issue 2, ISSN 2231-4288. Department of Banking and Finance, The Kingdom University. Retrieved from:

https://www.researchgate.net/publication/313790403_RELEVANCE_OF_CAPITAL_ASSET_PRICING_MODEL_-_A_REVIEW

Hellenic Shipping News Worldwide (HSNW). (2022). *Automation in Oil & Gas: Innovations and Benefits*. Retrieved from:

https://www.hellenicshippingnews.com/automation-in-oil-gas-innovations-and-benefits/

Huang, S., Tan, H., Wang, X., & Yu, C. (2021). *Valuation Uncertainty and Analysts' Use of DCF Models*. Review of Accounting Studies. Retrieved from:

http://dx.doi.org/10.1007/s11142-021-09658-w

IEA. (2022). Africa Energy Outlook 2022. Retrieved from:

https://www.iea.org/reports/africa-energy-outlook-2022/key-findings

IEA. (2022). *Global investments in oil and gas upstream in nominal terms and percentage change from previous year, 2010-2020.* Retrieved from:

https://www.iea.org/data-and-statistics/charts/global-investments-in-oil-and-gas-upstream-in-nominal-terms-and-percentage-change-from-previous-year-2010-2020

IEA. (2022) *World Energy Statistics and Balances*. Retrieved from:

https://www.iea.org/data-and-statistics/data-product/world-energy-statistics-and-balances

IEA. (2023). Fossil Fuels Consumption Subsidies 2022. Licence: CC BY 4.0. Retrieved from:

https://www.iea.org/reports/fossil-fuels-consumption-subsidies-2022

Ikoku, C.U. (1978). *Application of learning curve to the oil and Gas well drilling*. SPE California Regional Meeting. ISBN: 978-1-55563-727-9. Retrieved from:

https://doi.org/10.2118/7119-MS

International Monetary Fund (IMF). (2022). *Special Feature: Market Developments and the Pace of Fossil Fuel Divestment*. IMF Research. Retrieved from:

https://www.imf.org/-/media/Files/Research/CommodityPrices/WEOSpecialFeature/SFApril2022.ashx

JODI. (2023). *The JODI Oil World Database*. Retrieved from:

https://www.jodidata.org/oil/

J.P. Morgan. (2022). *2023 Long-Term Capital Market Assumptions*. Retrieved from:

https://am.jpmorgan.com/content/dam/jpm-am-aem/global/en/insights/portfolio-insights/ltcma/ltcma-full-report.pdf

Kaldestad, Y., & Møller, B. (2016). Verdivurdering (2. Utgave). Bergen: Fagbokforlaget.

Kinserdal et al. (2019). *Financial statement analysis: valuation - credit analysis - performance evaluation*. 1. e-bokutgave tilsvarer 1. trykte utgave 2017. Fagbokforlaget.

Koller et al. (2020). *Valuation Measuring and Managing the Value of Companies (7th ed.)*. John Wiley & Sons, Inc.

Mafiana et al. (2020). *An insight into the current oil spills and on-site bioremediation approaches to contaminated sites in Nigeria*. Environ Sci Pollut Res 28, 4073–4094 (2021). Retrieved from:

https://doi.org/10.1007/s11356-020-11533-1

Macrotrends. (2023). *Crude Oil Prices - 70 Year Historical Chart*. Retrieved from:

https://www.macrotrends.net/1369/crude-oil-price-history-chart

Market Research. (2023). *Africa Oilfield Services - Growth, Trends, and Forecasts (2023 - 2028)*. Mordor Intelligence. Retrieved from:

https://www.marketresearch.com/Mordor-Intelligence-LLP-v4018/Africa-Oilfield-Services-Growth-Trends-33193632/

Market Research. (2023). *Asia-Pacific Oilfield Services - Growth, Trends, and Forecasts (2023 - 2028)*. Mordor Intelligence. Retrieved from:

https://www.marketresearch.com/Mordor-Intelligence-LLP-v4018/Asia-Pacific-Oilfield-Services-Growth-33194267/

Market Research. (2023). *Europe Oilfield Services Market - Growth, Trends, Covid-19 Impact, and Forecasts (2023 - 2028)*. Mordor Intelligence. Retrieved from:

https://www.marketresearch.com/Mordor-Intelligence-LLP-v4018/Europe-Oilfield-Services-Growth-Trends-33192487/

Market Research. (2023). *Middle East Oilfield Services Market - Growth, Trends, Covid-19 Impact, and Forecasts (2023 - 2028)*. Mordor Intelligence. Retrieved from:

https://www.marketresearch.com/Mordor-Intelligence-LLP-v4018/Middle-East-Oilfield-Services-Growth-33486399/

Markets Insider. (2023). NOV Inc Registered SHS. Retrieved from:

https://markets.businessinsider.com/stocks/nov-stock#analyst

MarketWatch. (2023). *U.S. Dollar Index (DXY)*. Retrieved from:

https://www.marketwatch.com/investing/index/dxy

Mauboussin, M. J., & Callahan, D. (2021). *Everything Is a DCF Model.* Morgan Stanley Investment Management. Retrieved from:

https://www.morganstanley.com/im/publication/insights/articles/article_everythingisadcfmodel_us.pdf

Merrill, T.W., & Schizer, D.M. (2013). *The Shale Oil and Gas Revolution, Hydraulic Fracturing, and Water Contamination: A Regulatory Strategy*. 98 Minn. L. Rev. 145. Retrieved from:

https://scholarship.law.columbia.edu/faculty_scholarship/837

Moody's. (2023). *Issuer Details: Nov Inc*. Ratings & Regulatory. Retrieved from:

https://ratings.moodys.com/ratings/600043281

Narayan, P.K., Nasiri, M.A. (2020). *Understanding corporate debt from the oil market perspective*. Energy Economics, Volume 92, 104946, ISSN 0140-9883. Retrieved from:

https://doi.org/10.1016/j.eneco.2020.104946

Nasdaq. (2022). *Oilfield Service Providers Gain Momentum Amid Rising Oil Demand*. Nasdaq News and Insights. Retrieved from:

https://www.nasdaq.com/articles/oilfield-service-providers-gain-momentum-amid-rising-oil-demand

Nimmagadda et al. (2006). *Mapping of Oil and Gas Exploration Business Data Entities for Effective Operational Management.* 2006 4th IEEE International Conference on Industrial Informatics. Retrieved from:

https://doi.org/10.1109/INDIN.2006.275814

Nkem et al. (2022). *The impact of oil industry-related social exclusion on community wellbeing and health in African countries*. Sec. Public Health Education and Promotion, Volume 10 – 2022. Retrieved from:

https://doi.org/10.3389/fpubh.2022.858512

Norwegian Petroleum Directorate (NPD). (2019). *23rd licensing round – announcement*. Retrieved from:

https://www.npd.no/en/facts/production-licences/licensing-rounds/23rd-round/23rd-licensing-round---announcement/

Norwegian Petroleum Directorate (NPD). (2022). Drilling permit for well 6507/5-11. Retrieved from:

https://www.npd.no/en/facts/news/Drilling-permits/2022/drilling-permit-for-well-65075-11/

NOV Inc. (2018). *Annual Report 2017*. Retrieved from:

https://investors.nov.com/static-files/b6f7c56c-7ae7-498c-9017-22d2ed1d9113

NOV Inc. (2019). *Annual Report 2018.* Retrieved from:

https://investors.nov.com/static-files/e5cd02ed-9fd9-40f5-89a9-59c306864afd

NOV Inc. (2020). *Annual Report 2019*. Retrieved from:

https://investors.nov.com/static-files/6fc0f64a-7d93-4627-a6be-46fca4654861

NOV Inc. (2021). *Annual Report 2020*. Retrieved from:

https://investors.nov.com/static-files/7f5b6331-e6a9-48e8-9987-0b1bcce30a41

NOV Inc. (2022). *2021 Sustainability Report.* Retrieved from:

https://www.nov.com/about/sustainability

NOV Inc. (2022). *Annual Report 2021*. Retrieved from:

https://investors.nov.com/static-files/4a6ebe0e-8143-485f-8d7c-f8ac1a513eda

NOV Inc. (2022). *New Joint Industry Project goes subsea to provide a storage solution for all types of fluids.* Retrieved from:

https://www.nov.com/about/news/new-joint-industry-project-goes-subsea-to-provide-a-storage-solution-for-all-types-of-fluids

NOV Inc. (2023). *Flow Control Systems*. Retrieved from:

https://www.nov.com/products/flow-control-systems

NOV Inc. (2023). *Aftermarket Solutions*. Retrieved from:

https://www.nov.com/-/media/nov/files/products/caps/intervention-and-stimulation-equipment/intervention-and-stimulation-aftermarket-solutions/aftermarket-solutions-stimulation-acidizing-coiled-tubing-support-and-cementing-equipment-brochure.pdf

NOV Inc. (2023). *Rig Technologies*. Retrieved from:

https://www.nov.com/about/our-company-structure/rig

NOV Inc. (2023). *NOV Completion Tools*. Retrieved from:

https://www.nov.com/-/media/nov/files/products/caps/completion-tools/completion-tools-brochure.pdf?la=en-us&hash=E692853A6ACBCBE6ADB0C4463E8F65A5

NOV Inc. (2023). Intervention and *Stimulation Equipment*. Retrieved from:

https://www.nov.com/-/media/nov/files/products/caps/intervention-and-stimulation-equipment/intervention-and-stimulation-equipment-brochure.pdf?la=en-us&hash=62EB66A04494B37C37896ABBA8611E7C

NOV Inc. (2023). *Process and Flow Technologies*. Retrieved from:

https://www.nov.com/about/our-business-units/process-and-flow-technologies

Oil and Gas Overview. (2020). *What is Wireline in Oil and Gas?* Retrieved from:

https://oilandgasoverview.com/what-is-wireline-in-oil-and-gas/

OPEC. (2022). *OPEC Monthly Oil Market Report*. Organization of the Petroleum Exporting Countries (OPEC). Retrieved from:

https://www.opec.org/opec_web/static_files_project/media/downloads/publications/OPEC_MOMR_December_2022%20(archive).pdf

Phillips, E., & Jackson, P. (2015). *Beyond cost-cutting: The opportunity for oilfield services and equipment companies*. Bain & Company. Retrieved from:

https://www.bain.com/contentassets/2f7135a1b8d1420194d13f131f9cb1a6/bain_brief_beyond_cost_cutting.pdf

Porter, M. (2008). *The Five Competitive Forces That Shape Strategy.* Harvard Business Review 86(1):78-93, 137. Retrieved from:

https://www.researchgate.net/publication/5581445_The_Five_Competitive_Forces_That_Shape_Strategy

PWC. (2022). Risikopremien 2022. Retrieved from:

https://www.pwc.no/no/publikasjoner/risikopremien.html

PWC. (2023). *Corporate income tax (CIT) rates*. Worldwide Tax Summaries. Retrieved from:

https://taxsummaries.pwc.com/quick-charts/corporate-income-tax-cit-rates

Ransbotham et al. (2017). *Reshaping Business with Artificial Intelligence*. MIT Sloan Management Review. Retrieved from:

https://web-assets.bcg.com/img-src/Reshaping%20Business%20with%20Artificial%20Intelligence_tcm9-177882.pdf

Ravikumar, S. (2022). *UK gas producers boost domestic output by 26% in first half of 2022*. Reuters. Retrieved from:

https://www.reuters.com/business/energy/uk-gas-producers-boost-domestic-output-by-26-first-half-2022-2022-08-24/

Regjeringen. (2022). *Announcement of exploration area through APA 2022.* Ministry of Petroleum and Energy. Retrieved from:

https://www.regjeringen.no/en/aktuelt/announcement-of-exploration-area-through-apa-2022/id2918891/

Regjeringen. (2022). *Great interest in further exploration activity on the Norwegian shelf.* APA 2021. Retrieved from:

https://www.regjeringen.no/en/aktuelt/stor-interesse-for-videre-leteaktivitet-pa-norsk-sokkel/id2895836/

Restrepo, N., Uribe, J.M., Manotas, D.F. (2020). *Dynamic capital structure under changing market conditions in the oil industry: An empirical investigation.* Resources Policy, Volume 69, 101808, ISSN 0301-4207. Retrieved from:

https://doi.org/10.1016/j.resourpol.2020.101808

Seitz, T., Ati, N., Fantaguzzi, I., & Wood, C. (2020). *A winning OFSE agenda for current times*. McKinsey and Company. Retrieved from:

https://www.mckinsey.com/industries/oil-and-gas/our-insights/a-winning-ofse-agenda-for-current-times

SLB. (2023). *Innovation Factori*. SLB AI Solutions. Retrieved from:

https://www.software.slb.com/ai/innovation-factori/innovation-co-development

SLB. (2023). *Our Technology Development*. SLB About. Retrieved from:

https://www.slb.com/about/who-we-are/our-technology-development

SLB. (2023). *We are local everywhere*. SLB Our Global Footprint. Retrieved from:

https://www.slb.com/about/who-we-are/our-global-footprint

Statista. (2023). *COVID-19 cases worldwide as of February 28, 2023, by country or territory*. Health, Pharma & Medtech, State of Health. Retrieved from:

https://www.statista.com/statistics/1043366/novel-coronavirus-2019ncov-cases-worldwide-by-country/

TechnipFMC. (2022). *TechnipFMC Announces Third Quarter 2022 Results*. TechnipFMC Financial news releases. Retrieved from:

https://www.technipfmc.com/en/investors/financial-news-releases/press-release/technipfmc-announces-third-quarter-2022-results/

The White House. (2023). *Declaration of North America (DNA)*. Briefing Room, Statements and Releases. Retrieved from:

https://www.whitehouse.gov/briefing-room/statements-releases/2023/01/10/declaration-of-north-america-dna/

Thorbecke, C. (2019). *Supply, demand and 'geopolitical tensions': How oil prices rise.* ABC News. Retrieved from:

https://abcnews.go.com/Business/supply-demand-geopolitical-tensions-oil-prices-rise/story?id=65640000

Tordo, S., Warner, M., Manzano, O., & Anouti, Y. (2013). *Local Content Policies in the Oil and Gas Sector: A World Bank Study*. World Bank Publications.

UK Government. (2022). *UK government takes next steps to boost domestic energy production*. Department for Business, Energy & Industrial Strategy. Retrieved from:

https://www.gov.uk/government/news/uk-government-takes-next-steps-to-boost-domestic-energy-production

United Nations (UN). *13 Climate Action: Take urgent action to combat climate change and its impacts*. United Nations Stats Division. Retrieved from:

https://unstats.un.org/sdgs/report/2021/goal-13/

U.S. Department of Defense. (2023). *CORONAVIRUS: TIMELINE*. Retrieved from:

https://www.defense.gov/Spotlights/Coronavirus-DOD-Response/Timeline/

World Bank. (2022). *New Approaches to Closing the Fiscal Gap*. LAC Semiannual Update; October 2022. Washington, DC: World Bank. Retrieved from:

http://openknowledge.worldbank.org/handle/10986/38093

World Economic Forum (WEF). 2021. *136 countries have agreed to a global minimum tax rate. Here's what it means*. Retrieved from:

https://www.weforum.org/agenda/2021/11/global-minimum-tax-rate-deal-signed-countries/

World Economic Forum (WEF). (2021). *Cyber Resilience in the Oil and Gas Industry: Playbook for Boards and Corporate Officers*. Retrieved from:

https://www3.weforum.org/docs/WEF_Board_Principles_Playbook_Oil_and_Gas_2021.pdf

Xin, Z. (2022). *China's oil dependence on imports sees drop*. State Council of The People's Republic of China. Retrieved from:

https://english.www.gov.cn/news/topnews/202202/24/content_WS6216e221c6d09c94e48a569e.html

Yahoo Finance. (20223). *NOV Inc.* Retrieved from:

https://finance.yahoo.com/quote/NOV?p=NOV

Yahoo Finance. (2023). PHLX Oil Service Sector (^OSX). Retrieved from:

https://finance.yahoo.com/quote/%5EOSX/history?period1=1136073600&period2=1678492800&interval=1mo&filter=history&frequency=1mo&includeAdjustedClose=true

Yahoo Finance. (2023). *Treasury Yield 5 Years (^FVX)*. Retrieved from:

https://finance.yahoo.com/quote/%5EFVX?p=%5EFVX&ncid=yahooproperties_peoplealso_km0o32z3jzm

Yahoo Finance. (2023). *Treasury Yield 10 Years (^TNX)*. Retrieved from:

https://finance.yahoo.com/quote/%5ETNX/

YCharts. (2023). *Halliburton Co (HAL)*. Retrieved from:

https://ycharts.com/companies/HAL/market_cap

YCharts. (2023). *SLB (SLB)*. Retrieved from:

https://ycharts.com/companies/SLB/market_cap

Yüksel, I. (2012). *Developing a Multi-Criteria Decision-Making Model for PESTEL Analysis*. International Journal of Business and Management 7(24). Retrieved from:

http://dx.doi.org/10.5539/ijbm.v7n24p52

Özgür, S., & Wirl, F. (2020). *Cross-Border Mergers and Acquisitions in the Oil and Gas Industry: An Overview.* Faculty of Business, Economics and Statistics, University of Vienna. Retrieved from:

https://doi.org/10.3390/en13215580