

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO
FACULDADE DE ADMINISTRAÇÃO E CIÊNCIAS CONTÁBEIS

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**THE FINANCIAL PERFORMANCE EVALUATION OF THE OIL AND GAS
INDUSTRY THROUGH CASH FLOW RATIOS IN THE PERIOD FROM 2014 TO 2019**

RIO DE JANEIRO

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Monografia apresentada à Faculdade de Administração e Ciências Contábeis da Universidade Federal do Rio de Janeiro - UFRJ, como requisito parcial necessário à obtenção do grau de bacharel em Ciências Contábeis.

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RESUMO

Este estudo foca especificamente nos indicadores de desempenho financeiro obtidos através da Demonstração de Fluxo de Caixa (DFC) sugeridos por Braga e Marques (2001), com ênfase no fluxo de caixa das atividades operacionais. A seleção das empresas foi feita com base no valor de mercado para reforçar a relevância da pesquisa. Foram analisadas as 10 principais empresas de Petróleo e Gás, de capital aberto, com ações negociadas na SEC que publicam anualmente suas demonstrações financeiras no formato 20-F ou 10-K, no período de 2014 a 2019. O estudo pretende dar continuidade à pesquisa feita anteriormente por Abrahão, Carvalho e Marques (2015) para o período de 2010 a 2013. Os dados utilizados nesta pesquisa foram obtidos por meio do banco de dados do *site* Evaluate Energy. A análise dos resultados dos índices calculados mostra que a amostra seguiu um padrão semelhante de crescimento e redução ao longo dos seis anos observado em quase todas as categorias analisadas, para a maioria das empresas. O único indicador destoante foi o de qualidade do resultado, que não demonstrou um padrão consistente. Percebeu-se também que 2014 e 2018 foram os anos em que o maior lucro líquido foi apurado para a maioria das empresas analisadas, o que gerou um alto valor de dividendos pagos aos acionistas e o maior fluxo de caixa dos resultados operacionais no período analisado.

Palavras-chave: Indicadores de Fluxo de Caixa. Análise de Desempenho. Indicadores de Desempenho. Demonstração dos Fluxos de Caixa. Óleo e Gás.

ABSTRACT

This paper focuses specifically on the financial performance ratios resulting from the Cash Flow Statement suggested by Braga and Marques (2001), with emphasis on Cash Flow from Operations. The selection of the companies was based on the market value to reinforce the relevance of the research. Were analyzed the top 10 Oil and Gas public companies with shares traded on the SEC, that publish yearly their financial statements in 20-F or 10-K form, in the period from 2014 to 2019. The study intends to continue the research related to the period from 2010 to 2013 made by Abrahão, Carvalho, and Marques (2015). The data used in this research were obtained through the Evaluate Energy database. The analysis of the results from the ratios calculated shows that the sample followed a similar pattern of growth and reduction over the six years observed in almost all categories analyzed, for most companies. The only dissonant point was the quality of earnings ratio, which no consistent pattern was perceived. It was also noticed that 2014 and 2018 were the years in which the highest net income was obtained for most of the companies analyzed, which led to a high amount of dividends paid to shareholders and the highest cash flow from operations results in the period analyzed.

Keywords: Cash Flow ratios. Financial performance. Performance ratios. Financial evaluation. Oil & Gas Industry.

LIST OF FIGURES

Figure 1 - The Brent price of crude oil in 2013 and 2014	19
Figure 2 - Cash Dividend Coverage Ratio.....	27
Figure 3 - Quality of Earnings Ratio	28
Figure 4 - Capital Expenditures Ratio	30
Figure 5 - Cash Flow Return on Assets.....	32

LIST OF TABLES

Table 1 - Ratios for cash flow statement analysis used in this study	15
Table 2 - Leading oil and gas companies worldwide based on market capitalization as of November 2019	16
Table 3 - Ratios for cash flow statement analysis	25
Table 4 - Net income of the companies analyzed from 2014 to 2019	33

LIST OF ABBREVIATIONS

CFO	Cash Flow from Operations
FASB	Financial Accounting Standards Board
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
OPEC	Organization of the Petroleum Exporting Countries
US GAAP	Generally Accepted Accounting Principles

CONTENTS

1	INTRODUCTION.....	9
2	LITERATURE REVIEW.....	12
3	METHODOLOGY.....	16
4	RESEARCH RESULTS.....	19
4.1	OIL AND GAS INDUSTRY OVERVIEW FROM 2014 TO 2019	19
4.2	CASH FLOWS BEHAVIOR OF SELECTED COMPANIES	21
4.3	RATIOS ANALYSIS	25
5	CONCLUSION.....	35
	BIBLIOGRAPHY	38

1 INTRODUCTION

The purpose of this study was to analyze the financial performance of the 10 main companies in the oil and gas sector, based on the market value, using ratios obtained through the cash flow statement, in the period from 2014 to 2019.

In the current market scenario, in which high competitiveness requires companies to be more efficient in the management of their resources, organizations must seek mechanisms that assist in the planning and control of their capital, enabling continuity and good results for the business.

The Cash Flow Statement is an important management tool, due to its structural simplicity, providing a clearer and more objective reading of the financial situation of the companies to the stakeholders. Erich (2001) affirms that cash flow is the ultimate driver of business performance and value.

The main assumption of cash flow statements is to provide the necessary clarity to assess the company's liquidity and to determine the difference between the periodic result (gain or loss) and the change in the amount of cash. According to Carslaw & Mills (1991), integration of cash flow data with traditional ratios would provide a superior measure of performance over accrual accounting data alone.

The International Accounting Standards 7 (IAS 7) Statement of Cash Flows requires the disclosure of the cash flow statement as an integral part of its primary financial statements and prescribes how to present information in it. With the information supplied by the cash flow statement, the users of financial statements will be able to use and evaluate the information for economic decision-making purposes (Jooste, 2004).

According to Braga and Marques (2001), several performance ratios can be achieved from the cash flow statement, especially those that relate the cash flow from operations with another specific item. The authors proposed an analysis through four categories of ratios: cash coverage, quality of earnings, capital expenditures, and cash flow return.

The research aimed to evaluate, by calculating these four categories of ratios obtained through the cash flow statement, the financial situation of the 10 largest integrated oil and gas companies, with shares traded on the SEC, from 2014 to 2019.

As specific objectives, it was intended to apply the financial performance ratios in the sample's cash flow statements and to seek economic explanations for the behavior of the calculated ratios. It was not an objective with this study to contrast companies exhaustively, so that the comparison happened in a tenuous way through the results obtained by the ratios.

To achieve the objectives, descriptive research was carried out, since the present study exposes the cash flow characteristics of the 10 largest integrated companies in the oil & gas sector. This research was previously made by Abrahão, Carvalho, and Marques (2015), for the period from 2010 to 2013. Through the same methodology, the research was extended six years forward in this study, from 2014 to 2019.

The research sought to calculate and analyze four financial ratios, to answer the following question: how the ratios selected through the cash flow statement can be used in the analysis of liquidity and solvency of oil and gas companies?

The rationale for this paper is that oil is one of the most important commodities of modern civilization and the most important source of energy nowadays. According to the Overseas Development Institute (ODI), oil and gas together represent more than half (56%) of the world's total energy consumption in 2017. Given the indispensability of oil in human daily life, this segment requires details in the economic and financial analysis, seeking to gain broader financial control, covering all entrances, exits, and resource allocations, and one of the main tools that ensure this control is the Cash Flow Statement. Further, companies that have a performance that has such an impact on their industry should be analyzed to help investors and users of the information to have a clearer view of their financial situation.

About the limitations of the research, the sample size should be pointed out, once, according to Vargas and Mancina (2019), with small size, it is difficult to find meaningful relations and generalizations from the data since statistical tests require a larger sample size to guarantee a trend. Another limitation in this work that is important to note is the possible differences in the classification of interest and dividends, paid and received, between IFRS and US GAAP, which could cause bias in performance comparisons.

According to the purpose of the research, the paper is organized as follows. After this introduction, the second section will present the theoretical reference for the study, then the third

section will describe the methods used to carry out the study, while in the fourth section the research results will be presented and described and the fifth section will present final considerations.

2 LITERATURE REVIEW

The primary purpose of the cash flow statement is to provide relevant information about a company's cash payments and receipts over a given period. It must follow the guidelines of the Financial Accounting Standards Board (FASB), the regulatory body for American accounting practices, and the International Accounting Standards (IASB), a body that establishes international accounting standards, which have been progressively adopted by several countries (Santos, 2015).

The cash flow statement has prime importance in financial planning and control. Through this, the stakeholders visualize and guide the direction of the company making easier decision-making aiming for growth and better performance of the organization. Yoshitake and Hoji (1997) point out that many companies fail not for lack of profit, but lack of money because profit is not always synonymous with money. Business survival depends on financial performance. All available money must be well used.

Beaver (1968) sought in his research to discover alternative accounting measures for the prediction of bankruptcy. His study was intended to emphasize the need for empirical verification of a belief, citing areas where it was proven wrong, and to define a method for empirically evaluating alternative accounting measures. 79 bankrupt and 79 non-bankrupt companies were analyzed, totaling 158 companies, between the years 1954 and 1964, using 14 financial ratios in each of the companies.

According to Beaver (1968), it was indicated, with this study, that the ratios calculated based on cash flow better assess the financial situation of companies, being more effective in predicting bankruptcies than the ratios calculated through net working capital. The research revealed that the relationship between cash flow and total debt is capable of better predicting insolvency five years in advance. It was also observed that the analysis of the operational cash flow ratio on total debts was relevant because it has a better relative capacity to predict bankruptcies.

Dechow, Kothari, and Watts (1998) developed an operating cash flow model and a formal accounting process in which these cash flows were converted into accounting profit. The model implies that yields can predict better future operating cash flows than current operating cash flows, in which the difference between them varies according to the operating cash cycle. The sample comprised 1337 companies, between the years 1963 and 1992. The authors concluded that the

current income of a company is the best forecast of future cash flows, exceeding current cash flows, as predicted in the model studied. The authors also claim that the difference in the ability of current earnings and current cash flows to predict future cash flows is a positive function of the company's operating cash cycle.

Borges, Nunes, and Alves (2012), continuing the study by Barac (2010), compared the financial information obtained through ratios calculated from data prepared based on the assumptions of cash and accrual accounting. Were obtained data from reports and accounts of 82 companies in the years 2005 to 2009. The study demonstrated that the use of cash flow statements with the other financial statements profoundly helps in decision-making. The authors were able to demonstrate, through analysis, that both the model based on the accrual basis ratios and the model based on the cash flow ratios are effective in predicting the future classification situation of a company.

Caverzan and Baldissera (2017) in their research developed the financial planning process of a carrier through cash flow. This is an exploratory research, in the form of a case study, and the approach was qualitative based on data from the internal accounting system. As a result, a daily cash flow was developed using the model proposed by the authors and adapted to the company's reality, as well as the cash flow statement was carried out using the indirect method. In the end, the authors concluded that based on the models shown, the company has at its disposal a better view of the movements of the planned cash flow through the internal control performed.

Teixeira (2018) in his study sought to demonstrate the importance and effectiveness of using the cash flow tool to make decisions that involve the financial resources of the entity under study, through the analysis of the financial ratios calculated from the cash flow statement together with other financial statements. As a parameter for the study, the financial statements analyzed were Cash Flow Statement, Balance Sheet, Income Statement, and management reports for the period of 2014 to 2016 of a beach resort in southern Brazil.

Based on this analysis, Teixeira (2018) observed how the ratios behave and that the non-use of this tool can cause serious financial losses, since decision-making can occur non-objectively and often without reasoning, motivated by addictions or assumptions. Above all, due to the strong influence of seasonality that the hotel sector faces, the use of the tool can provide better planning conditions, expanding the managers' view of the activities that most contribute to the formation of

resources. A healthy and sustainable company plans its activities to reduce waste and increase profits, aiming at the continuity and growth of its operations.

Sunmola (2021) in his study aimed to find answers to the question of how cash flow ratios reveal various potential risks of an organization several years before the final cessation of business activity, to ascertain whether cash flow ratios can signal the evolution of health or not and show the usefulness of cash flow ratios in assess risks in an organization. The study involved a survey of Estonia's main water provider. The author used a quantitative method of analysis for five operational years, 2015 to 2019.

Through his research, Sunmola (2021) was able to show that cash flow ratios are very useful and instrumental in assessing risk in a company. Also, the cash flow ratios have effectively been able to show the cash position of a business and the evolution of the company's health from year to year. The author concluded that with the use of cash flow ratios, companies can assess their performance as well, and corrective measures can be taken as appropriate.

In the view of Vieira (2005), regardless of the method used, cash flow is of huge value to organizations, as together with the other financial statements it will compose important ratios of the company's financial health. On the other hand, it is useless to stop using such information as business management tools. Through well-made projections, the lack or excess of resources is verified in advance, as well as the analysis of the results obtained in the period.

Das (2019) claims that information on cash flows from operations, investments and financial activities precisely reflects the financial situation of companies and that Cash Flow Ratios are the better measures of Liquidity, Solvency, Efficiency, Sufficiency, and Profitability than Traditional Ratios.

Braga and Marques (2001) through a study on the assessment of companies' liquidity, sought to demonstrate the feasibility of financial analyzes made from data obtained from the cash flow statement. The authors classified some of the ratios obtained from the cash flow statement into four distinct categories of ratios: cash coverage, quality of earnings, capital expenditures, and cash flow return, according to Table 1 below.

Table 1 - Ratios for cash flow statement analysis used in this study

Category 1: Cash Coverage	Cash Dividend Coverage Ratio	Cash flow from operations / Dividends paid	Evidences the ability to pay dividends based on its operating cash flow
Category 2: Quality of Earnings	Quality of Earnings Ratio	Cash flow from operations / Operating profit	Demonstrates how much net operating income generated in operating cash
Category 3: Capital Expenditures	Capital Expenditures Ratio	Total Investing Activities / (Total Financing Activities + Total Operating Activities)	Compares the net flows needed for investment purposes with those generated by financing and operations
Category 4: Cash Flow Return	Cash Flow Return on Assets	Cash flow from operations / Total assets	Equivalent to the total return on investment, which is considered inclusive, for investment evaluation

Source: Prepared by the authors based on Braga and Marques (2001).

Abrahão, Carvalho, and Marques (2015) following this research used these four categories of indicators to analyze the financial performance of the 10 main integrated companies in the oil and gas sector, in the period from 2010 to 2013. Through the analysis, it was observed that the sample obeyed similar growth and reduction patterns in almost all categories analyzed over the four years, a fact that was not observed only concerning the quality of earnings, in which no consistent pattern was found.

3 METHODOLOGY

The sample consists of the 10 largest integrated Oil and Gas public companies with shares traded on the SEC that publish yearly their financial statements in 20-F or 10-K forms, in the period from 2014 to 2019. They are all integrated, which means they act in the entire oil production chain, from production to distribution. We work with stratified sampling since the companies were selected based on specific characteristics. The first characteristic to determine the population of the oil and gas companies was the market value in November 2019.

After selecting the 10 largest integrated oil and gas companies based on market value, it was identified that two of them were not listed on the SEC, the second characteristic used in sampling. Therefore, it was necessary to extend the selection to the 14th position so that we could exclude from the ranking the 4 companies not listed in the SEC of our research, keeping only the 10 largest with shares traded.

Most companies with relevant market value, are shown in Table 2, below:

Table 2 - Leading oil and gas companies worldwide based on market capitalization as of November 2019

Ranking in November 2019	Company	Market Capitalization (in billion U.S. dollars)	Headquarter
1	ExxonMobil	294,49	U.S.
2	Royal Dutch Shell	232,70	The Netherlands
3	Chevron Corporation	220,62	U.S.
4	PetroChina	145,78	China
5	Total	142,20	France
6	BP Plc.	130,78	UK
7	Petrobras	103,80	Brazil
8	Sinopec	81,08	China
9	CNOOC Ltd	68,14	U.S.
10	Equinor ASA	63,75	Norway

Source: adapted from Financial Times Global Equity Screener list.

The sample is considered representative of the sector, as it contains the main oil & gas producing companies in the world. The applied data were obtained from the database of the Evaluate Energy website and were structured by the company so that it was possible to analyze the behavior of its cash flows through graphs developed using Excel spreadsheets.

This study is classified as descriptive research, which objective according to Silva (2006), is to describe the characteristics of a population or phenomenon and establish relationships between the variables studied, and in the context of this typology, describing can be understood as identifying, reporting and/or comparing.

In scientific research, according to Raupp and Beuren (2008), the procedures adopted determine how the study will be conducted and how the data will be obtained. According to that, the procedures applied to the development of this work were documentary and ex post facto.

Raupp and Beuren (2008) affirm that documentary research is the one in which documents are considered scientifically authentic, not fraudulent, including reports, books, and accounting statements.

Ex post facto study or after-the-fact research is a category of research design in which the investigation starts after the fact has occurred without interference from the researcher. According to Vergara (1998), this research is applied when the researcher cannot control or manipulate the variables.

The comparison will be quantitative with the historical series of each organization, as it will analyze the four categories of financial performance ratios obtained by using cash flow statement data.

As can be seen in Table 1, earlier presented, most of the ratios that will be operated in this study are based on the Cash Flow from Operations (CFO), which is the cash flow generated, or applied, by the entity's operating activities. These ratios relate the CFO to a specific item, such as total assets or operating profit, to measure the ability to pay or return in comparison with any equity item, for example.

The ratios are segregated into four categories: cash coverage, quality of earnings, capital expenditures, and cash flow return.

Concerning the first category, the cash coverage ratio allows assessing the company's liquidity. This study will specifically use the cash dividend coverage ratio, which, according to Braga and Marques (2001), provides the company's ability to pay its preferred and common dividends, assessing the availability to honor the commitments, set out in its bylaws.

In the second category, the performance ratios refer to the quality of earnings. This ratio compares the cash flow from operations with the operating profit for the period and indicates the difference between cash flows and operating profit based on accrual accounting. For example, a ratio of 0.5 indicates that for every US\$ 1.00 in operating profit were generated US\$ 0.50 of cash. Braga and Marques (2001) state that this ratio intends to indicate the dispersion between cash flows and profit, since the latter is the result of revenues, costs, and expenses, which include amounts not yet received or paid and non-cash expenses, such as depreciation, causing marked differences between them, once there is no direct impact on cash.

The third category covers measures of capital expenditures, those expenses incurred but recorded as items of permanent assets, which will generate benefits in future periods. Analyzing the correlation between operating, investing, and financing cash flows allows identifying how investments have been financed. Braga and Marques (2001) highlight that this ratio tends to oscillate over the years in such a way that abrupt variations can be observed in certain periods. Alternatively, the use of average values obtained over a series of years would be adequate.

The fourth and last category is relevant to stakeholders' decision-making since it presents the recovery of cash on investment. The cash flow return on assets is equivalent to the return on total investment, key profitability ratio, based on an accrual basis. The comparison of this ratio with the real interest rate represents one of the criteria for performance evaluation. A ratio of 0.5 indicates, in the period analyzed, a return of 50% of the total investment made in the company, in terms of cash availability.

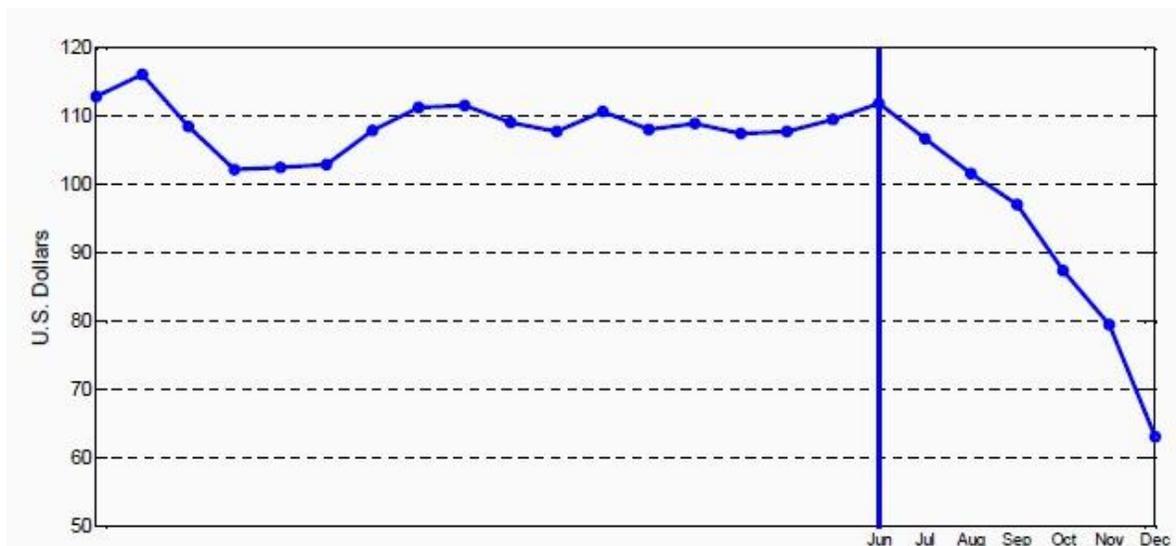
Considering four categories of ratios for ten companies over six years, two hundred and forty ratios will be calculated and analyzed in this study.

4 RESEARCH RESULTS

4.1 OIL AND GAS INDUSTRY OVERVIEW FROM 2014 TO 2019

During this period, the entire oil and gas industry around the world experienced turbulence due to the fell in Brent price of crude oil as a result of a serious crude oil surplus that started at the end of 2014 due to several factors such as booming U.S. oil production, falling demand in commodity markets due to Chinese economy slowdown and geopolitical rivalries among oil-producing nations.

Figure 1 - The Brent price of crude oil in 2013 and 2014



Source: <https://www.weforum.org/agenda/2015/02/what-caused-the-big-fall-in-oil-prices/>

After a period of relative stability, peaking in mid-2014 when it was traded at approximately US\$111, the Brent price of crude oil fell by 44%, between June and December 2014. Figure 1 shows that the cumulative decline between June and December 2014 alone was 44% (or \$49).

Resulting in one of the most dramatic declines in the price of oil in recent history, it was the worst price fall since 2008, when oil prices lost more than half of their value amid an international financial crisis. The price collapse at the end of 2014 is an immediate consequence of the deep imbalance between global oil supply and demand in which a large excess of production capacity contrasts with a sharp slowdown in demand. Add to this the refusal of Saudi Arabia and other OPEC producers to continue exercising their traditional role of regulating the balance between oil supply and demand through production cuts.

Fluctuations throughout 2015 continued to show a downward trend. The commodity ended 2015 with an accumulated drop of 35% and started to downhill in 2016, when the Brent price of crude oil reached the lowest value in 12 years, being traded below US\$30 in January of this year.

The fall in prices directly affects companies that explore oil and investments in the sector. Due to uncertainty, several oil companies around the world halted exploration and cut spending. In 2015, the industry paralyzed more than 1,000 drilling rigs and recorded a \$ 100 billion spending cut. At the end of this year, The Telegraph (2015) quoted a major oil broker as saying, "The world is floating in oil. The numbers we are facing now are dreadful"

In early 2016, crude oil prices fell sharply, hitting mid-US\$20s in February. According to the U.S. Energy Information Administration (EIA) (2017), despite robust demand for petroleum products, relatively high production and inventory levels provided downward pressure on crude oil prices throughout most of 2016, making the annual average even lower than the 2015 average. However, the price of oil increased and ended the year above US\$50 per barrel after agreements to curb production from January 2017 within the Organization of the Petroleum Exporting Countries (OPEC) and additional pledges by some key non-OPEC producers.

The OPEC agreement to curtail crude oil production in 2017 and subsequent extension of that agreement through 2018 tightened crude oil supplies, which put upward pressure on crude oil prices, ending 2017 at US\$60/barrel, the highest end-of-year price since 2013.

Brent crude oil averaged \$72 per barrel in 2018 and hit its highest price during the year on October 3 at \$86 per barrel, recovering to pre-2015 levels. However, Brent prices fell rapidly after that, as surging oil production in the U.S., Russia, and among key members of OPEC has helped to create a glut in global markets. In the following month, oil prices dropped 22%, the biggest monthly loss in a decade, according to MarketWatch (2018).

Based on the U.S. Energy Information Administration's (EIA) (2020), throughout 2019, increases in U.S. petroleum production put downward pressure on crude oil prices. In addition, the production increases likely limited the effect on prices from the attack on Saudi Arabia, production cut announcements from the Organization of the Petroleum Exporting Countries (OPEC), and U.S. sanctions on Iran and Venezuela that limited crude oil exports from those countries.

4.2 CASH FLOWS BEHAVIOR OF SELECTED COMPANIES

Exxon Mobil Corporation is a multinational oil and gas company in the United States that occupies the first position in the world ranking of oil and gas companies with the highest market value and was once the largest publicly traded company on the planet.

During the first year analyzed, Exxon Mobil showed an upward trend in its cash flows generated by operating activities, a fact that did not last in the two subsequent years, which had a significant reduction in 2015 and 2016. In 2017 and 2018, there was an increase in this ratio's result, which contributed to an improvement in the company's solvency levels. The cash flow applied in investing activities showed reductions in 2015 and 2016 as well as the cash flow from operating activities, a fact that proves the containment of the company's investments during the period of crisis in the sector, presenting increases only from 2017 onwards.

Royal Dutch Shell, better known as Shell, is a global group of energy and petrochemical companies with more than 80,000 employees in more than 70 countries. Its operations are divided into Upstream, Integrated Gas and Renewables and Energy Solutions (formerly New Energies), and Downstream, besides the Projects & Technology organization that manages the delivery of Shell's major projects and drives the research and innovation.

Shell increased its cash flow from operations in 2014, which indicates an increase in the company's operations this year. However, in 2015 and 2016 there was a noticeable reduction in this flow, growing again in the years 2017 and 2018, which indicates an increase in the company's operations, but declining in 2019. Related to the cash flow from investing activities, there was a progressive increase in cash outflows from 2014 to 2016, with a significant reduction only in 2017, as in 2018 and 2019 outflows increased again. The financing activities generated cash only in 2015, after reversing cash consumption in 2014, which happened again from 2016 to 2019, with 2017 being the year in which there was the greatest increase in cash outflow from this flow.

Chevron Corporation, headquartered in the United States, is an integrated energy company with operations in countries located around the world. The Company produces and transports crude oil and natural gas. Chevron also refines, markets, and distributes fuels, as well as is involved in chemical and mining operations, power generation, and energy services.

Chevron had a decrease in operating cash flow generation in the period from 2014 to 2016, resuming growth in 2017, contributing to solvency rates, which were only sustained until 2018, then decreasing again in 2019. In the first year analyzed, the company used cash from its financing activities. In 2015, the company generated cash through financing activities, and in 2016 there was still little cash generation. The company returned to consuming cash through its financing activities between the years 2017 and 2019, the last year being the one with the highest consumption. Throughout the analysis period, investment activities used cash, showing a downward trend between 2014 and 2017, highlighting the year 2017 when the reduction was halved. After this last year of great reduction, cash consumption increased again in 2018, not sustained until 2019 as it decreased again.

PetroChina Company Limited (“PetroChina”) is the largest oil and gas producer and distributor, playing a dominant role in the oil and gas industry in China. It is not only one of the companies with the biggest sales revenue in China, but also one of the largest oil companies in the world. PetroChina was established as a joint-stock company with limited liabilities by China National Petroleum Corporation (CNPC) in 1999 and it engages in a wide range of activities related to oil and natural gas, including exploration, development, production, and marketing of crude oil and natural gas; refining, transportation, storage and marketing of crude oil and oil products; the production and marketing of primary petrochemical products, derivative chemicals, and other chemicals; transportation of natural gas, crude oil, and refined oil, and marketing of natural gas.

Regarding cash flow from operations, 2014 was the year where PetroChina obtained the highest cash generation, decreasing in 2015 and 2016, recovered in 2017 and 2018, with a small reduction in 2019. The cash flow from financing activities used cash in the six years analyzed, gradually increasing from 2016 to 2018 and decreasing dramatically in 2019. Similar to the cash flow from financing activities, the cash flow from investing activities also used cash throughout the period analyzed, there was a gradual reduction in 2015 and 2016 and an increase in 2017 and 2019, with a greater increase in this last year, contrary to the financing activities.

Total is a French multinational broad energy company that produces and markets fuels, natural gas, and electricity. Active in more than 130 countries, with 100,000 employees, their ambition is to become the responsible energy major. Its businesses cover the entire oil and gas chain, from crude oil and natural gas exploration and production to power generation,

transportation, refining, petroleum product marketing, and international crude oil and product trading. Total is also a large-scale chemicals manufacturer.

Total's cash flows from operating activities decreased during the first three years analyzed. However, in 2017 the company reversed this scenario and showed an increase in the generation of the referred cash flow, which was sustained until 2019, the year with the highest generation of cash flow in the period analyzed. Related to financing cash flows, there was cash generation in the period from 2014 to 2016 and cash consumption in the period from 2017 to 2019. Financing activities used cash throughout the period analyzed, with a reduction in consumption between 2014 and 2017 and an increase in 2018 and 2019.

BP plc is a British multinational oil and gas company headquartered in London, England. It is a vertically integrated company operating in all areas of the oil and gas industry, including exploration and production, refining, distribution and marketing, power generation, and trading. It also has renewable energy interests in biofuels, wind power, smart grid, and solar technology.

BP had its peak of cash flow generation growth from operating activities in 2014, having a considerable reduction in 2015, which was repeated in 2016. However, from 2017 to 2019 there was a gradual increase in cash generation from operating activities, a fact that demonstrates the expansion of its operations and acts positively in the business' solvency rates. Regarding the cash flow from financing activities, cash consumption remained practically stable in all the years analyzed, except for the year 2016 that generated cash and the year 2019 when consumption more than doubled. The cash outflows from investing activities increased only in 2018, in all other years there was a reduction.

Petrobras is a Brazilian company with more than 49,000 employees, controlled by the government, one of the largest oil and gas producers in the world, operating mainly in the exploration and production, refining, generation, and commercialization of energy.

Petrobras maintained its cash generation from operating activities stable between the years 2014 and 2019, with a slight increase in 2018. In 2014, the company generated cash from its financing activities, however, as of 2015, financing activities started to consume cash and had a considerable increase over the years. The net cash outflows from the investing activities had a

reduction in all years during the analyzed period, with a significant reduction in 2015, 2018, and 2019.

China Petrochemical Corporation (Sinopec Group) is a super-large petroleum and petrochemical, enterprise group. It is the largest oil and petrochemical products supplier and the second-largest oil and gas producer in China, the largest refining company and the third-largest chemical company in the world. Its total number of gas stations ranks second place in the world.

Sinopec presented a decrease in the generation of operating cash flow in 2014, a situation that was reversed in the years 2015 and 2016, when the company generated cash from its operating activities, in the opposite direction to the sector crisis. Also, in the opposite direction to the sector, in the period from 2017 to 2019 its generation of operating cash flow decreased again. About investment activities, there were significant reductions in cash consumption between 2014 to 2016, followed by a significant increase in cash outflows in 2017, halving in 2018, and rising again in 2019. The cash flow from financing activities used cash in 2014, unlike 2015 when there was a small generation of cash, a fact that did not last the following year when the company returned to consume cash through its financing activities with cash outflows from 2016 to 2019 with emphasis on the year 2016 when the referred outflow was 10 times greater than that of 2015.

CNOOC Limited, together with its subsidiaries, is the largest producer of offshore crude oil and natural gas in China and one of the largest independent oil and gas exploration and production companies in the world. The Group mainly engages in the exploration, development, production, and sale of crude oil and natural gas. The company that was founded in 1999 is headquartered in Hong Kong and has more than 18,000 employees.

Concerning cash flows from operating activities, 2014 was the year in which the company had the highest cash flow generation, decreasing in 2015 and 2016 and rising again in 2017, maintaining the growth pace until the end of the period analyzed. The cash flow from financing activities used cash in all years analyzed, with a reduction from 2014 to 2015 and a significant increase in the following year, remaining stable in the other years. As well as in operating activities, cash flows from investing activities showed peak cash consumption in 2014 with decreases in 2015 and 2016, and increases in 2017 and 2018, decreasing again in the last year analyzed.

Equinor ASA is a Norwegian state-owned multinational energy company headquartered in Stavanger. It is primarily a petroleum company, operating in more than 30 countries with additional investments in renewable energy. The company, which is the largest operator on the Norwegian continental shelf and the second-largest gas exporter to Europe, has over 21.000 employees.

Equinor had the largest cash flow generation from its operating activities in 2014 and in the following two years it presented a considerable reduction. In 2017 the company increased its cash generation capacity again through operating activities, which was sustained in the following year but did not follow in 2019. About financing activities, there was a reduction in cash outflows of approximately 80% from 2014 to 2015. In 2016 and 2017, the increase in cash outflows more than doubled in both years, thus remaining stable until 2019. For investment activities, it is possible to notice a gradual decrease in cash consumption between the years 2014 and 2016, with no variation, however, in the period 2017 to 2019.

4.3 RATIOS ANALYSIS

Based on the methodology and literature review discussed in this work, Table 3 shows the value of the indices that were obtained through the relationship of the values of the cash flow statement with other equity items.

Table 3 - Ratios for cash flow statement analysis

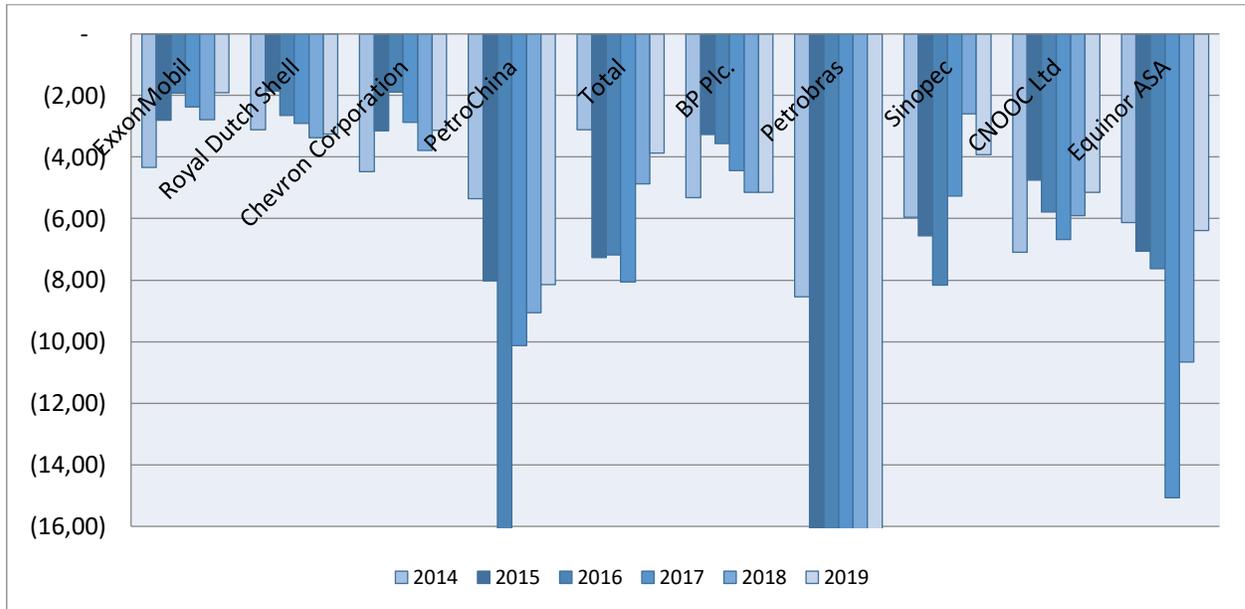
Cash Dividend Coverage Ratio	2014	2015	2016	2017	2018	2019
ExxonMobil	(4,34)	(2,80)	(1,93)	(2,38)	(2,79)	(1,90)
Royal Dutch Shell	(3,12)	(1,86)	(2,64)	(2,90)	(3,38)	(3,25)
Chevron Corporation	(4,48)	(3,15)	(1,89)	(2,88)	(3,79)	(3,14)
PetroChina	(5,35)	(8,02)	(25,70)	(10,12)	(9,07)	(8,14)
Total	(3,11)	(7,27)	(7,19)	(8,06)	(4,87)	(3,87)
BP Plc.	(5,32)	(3,27)	(3,56)	(4,44)	(5,15)	(5,15)
Petrobras	(8,54)	(432,55)	(451,79)	(190,25)	(42,43)	(16,93)
Sinopec	(5,96)	(6,56)	(8,16)	(5,27)	(2,59)	(3,93)
CNOOC Ltd	(7,10)	(4,74)	(5,79)	(6,68)	(5,91)	(5,16)
Equinor ASA	(6,13)	(7,05)	(7,62)	(15,08)	(10,67)	(6,38)
Quality of Earnings Ratio	2014	2015	2016	2017	2018	2019
ExxonMobil	0,99	1,54	2,88	1,63	1,23	1,35

Royal Dutch Shell	1,29	72,85	6,18	1,89	1,59	1,99
Chevron Corporation	1,11	4,60	N/D	2,32	1,48	4,04
PetroChina	2,13	3,47	4,57	4,81	3,14	3,00
Total	2,14	4,55	3,43	2,21	1,42	1,56
BP Plc.	12,89	N/D	N/D	4,29	2,26	4,07
Petrobras	N/D	N/D	6,61	2,68	1,77	1,62
Sinopec	2,43	2,97	2,44	2,84	2,47	2,26
CNOOC Ltd	1,77	5,53	N/D	2,95	1,73	1,77
Equinor ASA	1,88	14,30	71,88	1,64	1,43	2,33
Capital Expenditures Ratio	2014	2015	2016	2017	2018	2019
ExxonMobil	(0,98)	(0,99)	(0,93)	(1,06)	(0,90)	(0,96)
Royal Dutch Shell	(0,61)	(0,68)	(1,46)	(1,07)	(0,46)	(1,12)
Chevron Corporation	(1,04)	(1,03)	(1,20)	(1,02)	(0,60)	(1,19)
PetroChina	(0,78)	(0,88)	(0,82)	(0,81)	(0,96)	(0,89)
Total	(0,77)	(0,96)	(0,85)	(0,69)	(1,29)	(0,95)
BP Plc.	(0,57)	(0,96)	(0,93)	(0,64)	(0,76)	(0,65)
Petrobras	(0,96)	(0,57)	(1,58)	(0,79)	N/D	N/D
Sinopec	(0,87)	(0,59)	(0,43)	(0,85)	(0,59)	(1,19)
CNOOC Ltd	(0,73)	(0,84)	(0,72)	(0,80)	(0,89)	(0,62)
Equinor ASA	(0,56)	(0,69)	(0,89)	(0,66)	(0,47)	(0,62)
Cash Flow Return on Assets	2014	2015	2016	2017	2018	2019
ExxonMobil	0,15	0,10	0,07	0,09	0,11	0,08
Royal Dutch Shell	0,08	0,05	0,06	0,08	0,14	0,13
Chevron Corporation	0,13	0,10	0,06	0,09	0,13	0,12
PetroChina	0,15	0,12	0,12	0,13	0,16	0,14
Total	0,10	0,10	0,09	0,09	0,09	0,10
BP Plc.	0,11	0,08	0,06	0,10	0,13	0,12
Petrobras	0,11	0,12	0,12	0,12	0,14	0,15
Sinopec	0,12	0,12	0,13	0,13	0,14	0,12
CNOOC Ltd	0,22	0,15	0,13	0,17	0,21	0,20
Equinor ASA	0,25	0,18	0,14	0,20	0,25	0,18

Source: the authors.

The following graph (Figure 2) reveals the analysis of the first category of ratios, the cash dividend coverage ratio, calculated through the coverage ratio of dividends paid with cash for all analyzed companies, between 2014 and 2019.

Figure 2 - Cash Dividend Coverage Ratio



Source: the authors.

Between 2014 and 2015, half of the companies analyzed registered a reduction in the dividend coverage ratio, while the other half showed an increase, highlighting Total, which doubled the result of its ratio from 2014 to 2015, due to lower dividends paid in 2015, less than half compared to the previous year.

In 2016 and 2017, this ratio showed an increasing trend for practically all organizations, except for the American companies ExxonMobil and Chevron in 2016 and for Chinese companies PetroChina and Sinopec in 2017, which it is possible to notice a reduction. It is noteworthy that in 2016, PetroChina stands out, with a tripled ratio compared to the previous year, due to lower dividends paid, the same reason for the increase presented by Total in 2015. In 2017, Equinor ASA revealed a result twice as high as the previous year, driven by a great increase in its operating cash flow mainly due to increased prices combined with higher production.

The decrease in this ratio for the American companies ExxonMobil and Chevron in 2016 is linked to the reduction in the cash flow from operations, which is still related to the lower crude oil

price environment that started in the second half of 2014, unlike other companies in the sector that with the increase of crude oil in 2016 managed to reverse the negative impacts of that drop.

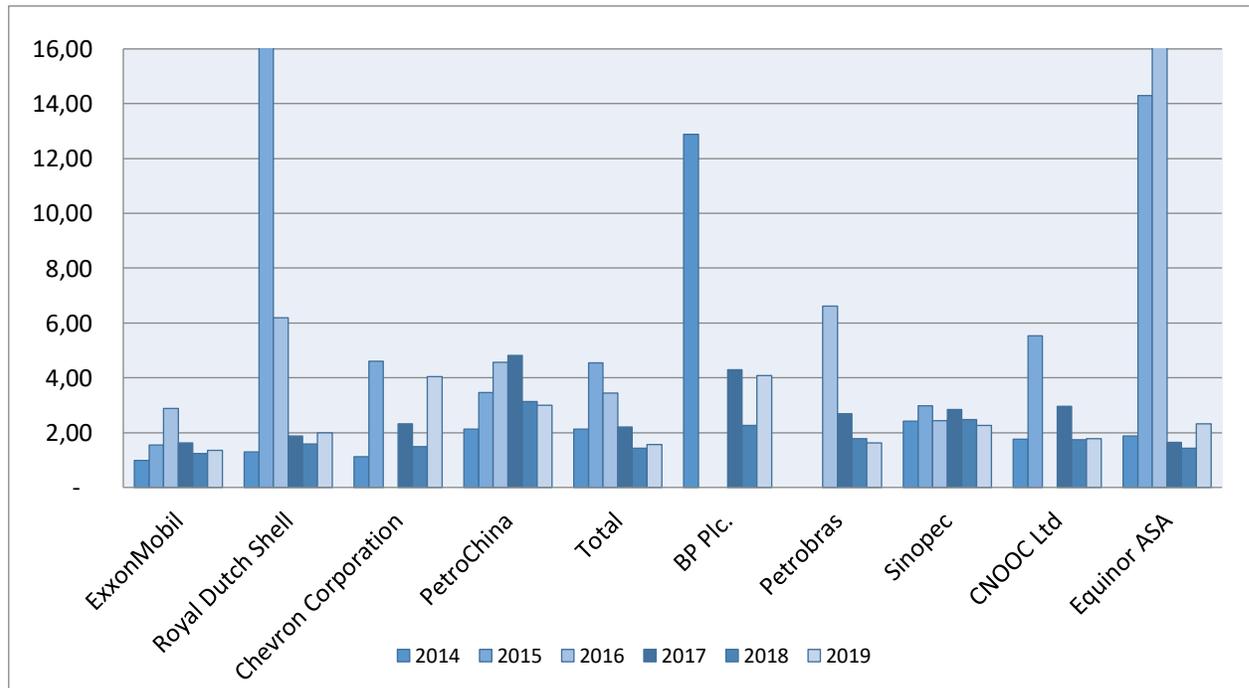
Also in the opposite direction of the sector, the Chinese PetroChina and Sinopec decreased the ratio in 2017. In fact, the decrease in PetroChina, was the normalization of the high ratio presented in the previous year, due to a decrease in dividends paid in 2016, as previously mentioned and the decrease in Sinopec's ratio was due to the increase in dividends paid this year.

In the last two years analyzed, 2018 and 2019, a downward trend was assumed. In 2018, 60% of companies had a reduction in the ratios, while in 2019 all had, except Sinopec, which paid fewer dividends than in the previous year, pushing the ratio up.

It is important to emphasize that the Brazilian Petrobras demonstrated behavior completely outside the curve throughout the period analyzed due to the corruption scandal that occurred in this same period, named “Operation Car Wash”.

The graph below shows the analysis of the second category of ratios, the quality of earnings ratio, calculated from 2014 to 2019.

Figure 3 - Quality of Earnings Ratio



Source: the authors.

Regarding the results obtained in the quality of earnings in the first three years, the analyzed sample did not obtain a particularity or rule. The British Petroleum (BP), for example, intriguingly, in 2014 had the highest rate among the companies analyzed (12.89), that is, for every US\$1.00 of operating profit, the company generated US\$12.89 into cash flow from operations.

The year 2014 was pivotal for BP. According to the financial statements of the company, despite the increasingly challenging business environment, they completed the 10-point plan they had set out in 2011 to make BP a safer, stronger, better performing business. The operating cash flow in 2014 was higher in line with this plan, despite lower profit which was partially offset by movements in the adjustments for non-cash items, including depreciation, depletion and amortization, impairments and gains and losses on sale of businesses and fixed assets.

However, in the following two years, BP was one of the only ones to have losses, making it impossible to calculate the ratio, as well as CNOOC and Chevron, which also had losses in 2016. On the other hand, Equinor and Royal Dutch Shell had much higher ratios than other companies in 2016 and 2017, driven by a strong operational performance, which partly offset the impact of lower oil and gas prices.

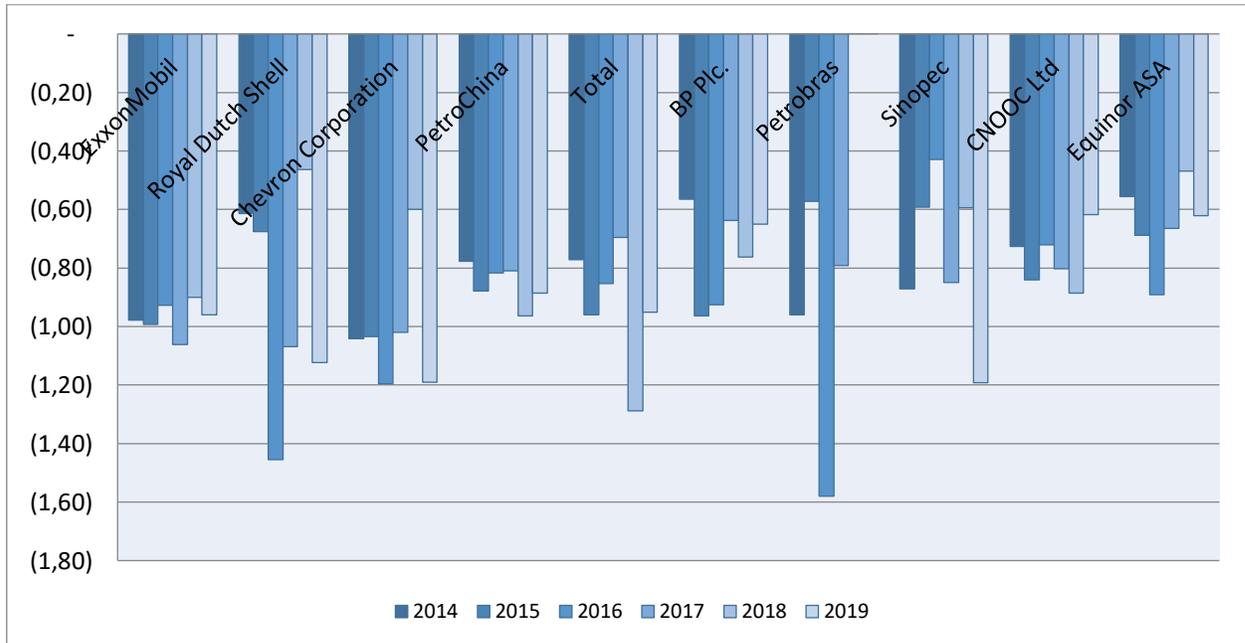
In the last three years, from 2017 to 2019, it is possible to see similar patterns. In 2017 and 2018, all companies showed a reduction in this ratio, apart from the Chinese PetroChina and Sinopec, which showed a slight increase in 2017. PetroChina claimed that this was mainly due to a decrease in tax expenses during the reporting period. Sinopec affirmed that in 2017 they strengthened meticulous management and enhanced their project profitability with operating cash flow hitting a record high, justifying the trend in the opposite direction to that presented by other companies in the sector.

The downward trend was reversed in 2019 when the result of this ratio increased for all companies, coincidingly with the exception again for the Chinese PetroChina and Sinopec, which had a small decrease.

The columns without information in Figure 3 refer to undetermined data described in Table 3 as not defined (N/D). It was not possible to calculate these ratios due to the absence of profits in these periods.

Figure 4 shows the graph with values obtained between 2014 and 2019, for the analyzes of the third category of ratios, the capital expenditure ratio, calculated using cash flows from investment activities on the cash flows from financing activities.

Figure 4 - Capital Expenditures Ratio



Source: the authors.

It was observed that there was an increase in the ratio for 70% of the companies between 2014 and 2015, with emphasis on British Petroleum, which presented growth well above the average, with a ratio of 0,96, which means that practically all the cash generated in financing and operating activities were applied into investing activities. Petrobras, Sinopec, and Chevron followed the opposite path in this period, showing reductions instead of growth in this ratio.

Regarding 2016, the effect observed was the opposite of that described in the previous period (2014-2015), only 40% of the companies showed growth in the ratio, a fact that indicates that the cash flows used for investments in these companies have become, over the years, increasingly higher compared to those achieved through financing activities. This year, the company Royal Dutch Shell stood out, presenting not only a high rate, but more than double the rate compared to the previous year due to the increase in cash outflows from investment activities, driven by the acquisition of BG Group plc (BG) which was a transformational step for Shell.

In 2017 the downward trend was maintained for most companies. However, Sinopec, which presented a reduction in this ratio in the two previous years, presented high growth. Despite the growth against the other companies, the result for the year was in line with the others. In the following year, 2018, the highlight was for TOTAL, which had the highest rate and growth of 85% compared to the previous year.

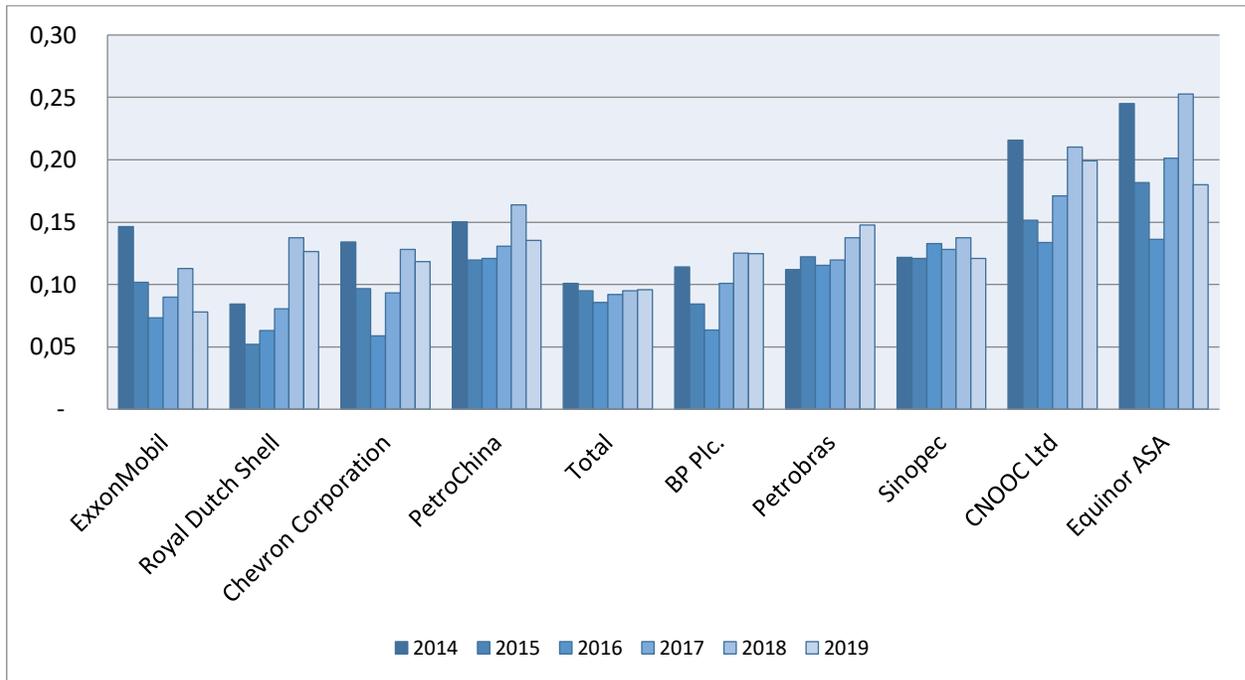
Specifically for 2019, no similar behavior was observed between companies and the sample was divided between growth and reduction of this ratio. For companies that showed growth in this ratio, high rates were noted, such as Royal Dutch, Chevron, and Sinopec, where the first showed a result of 1.12 and both last two of 1.19, a fact that means that the cash flows used for investments were 1.12/1.19 times higher than those obtained through financing activities.

In the two last years analyzed, 2018 and 2019, Petrobras presented undetermined results for this ratio, since the cash flow used by financing activities was greater than the cash flow provided by operating activities. Due to this, there is no information in Figure 4 for the company in these two years, in the same way that the results of these years were reported as not defined (N/D) in Table 3.

According to the financial statements reported by Petrobras in this period, this increase in cash flows used by financing activities was explained by the decrease in new loans and leases and the increase in settlement of old ones, in line with the company's Business and Management Plan which aims to settle old debts, without capturing new ones to improve the debt profile.

The graph below (Figure 5) displays the analysis of the fourth and last category of ratio, that of cash flow returns, obtained through the cash return on the company's total assets between 2014 and 2019.

Figure 5 - Cash Flow Return on Assets



Source: the authors.

Among the companies analyzed, the cash flow return on assets showed a decrease between the years 2014 and 2016, with subsequent growth in 2017 and 2018, which was not sustained in 2019, when it fell again.

The drop between 2014 and 2015 was verified in all the companies analyzed, except for Petrobras, a fact that does not cause distortions in the analysis due to the overvaluation of Petrobras assets as a result of the scandals “Operation Car Wash” already mentioned in this study. The downward trend was maintained for 2016, but Sinopec and Royal Dutch Shell showed an increase, with emphasis on the latter, which increase is linked to the acquisition of BG Group plc (BG), which was a transformative step for Shell, as already mentioned in this paper.

In 2017 and 2018, all companies managed to reverse the downward trend shown in previous years and showed growth in the ratio. This growth was not sustained in the last year analyzed, except for Petrobras and TOTAL, which continued to grow.

The cash flow returns on total assets presented by CNOOC and Equinor, which presented above-average results over the period analyzed, stood out in the graph. These companies presented results for this ratio, respectively, of 22% and 25% in 2014, for example, which means that the

total assets, the base of the company's investments, provided a return of 22% and 25% in cash. Another highlight was perceived for Shell, which almost doubled its results between 2014 and 2019.

From the analysis developed, it was possible to see that the sample obeyed similar patterns of growth and decline over the six years in almost all categories analyzed, for most companies, a fact that was not observed only concerning the quality earnings ratio, which no consistent pattern was found.

About net income, it can be seen in table 4 that from 2014 to 2019 there were large variations in the profits obtained by the companies. In 2014 most companies showed excellent results, but in the next two years there was a drastic reduction in profits. In 2017, there was a resumption of profits and in 2018 the highest profits of the entire period were presented. The following and last year analyzed, there was a small reduction.

Table 4 - Net income of the companies analyzed from 2014 to 2019

Net Income	2014	2015	2016	2017	2018	2019
ExxonMobil	32.520,0	16.150,0	7.840,0	19.710,0	20.840,0	14.340,0
Royal Dutch Shell	14.874,0	1.939,0	4.575,0	12.977,0	23.352,0	15.842,0
Chevron Corporation	19.241,0	4.587,0	-497,0	9.195,0	14.824,0	2.924,0
PetroChina	17.443,8	5.697,6	1.180,7	3.382,4	8.003,1	6.619,7
Total	4.244,0	5.087,0	6.196,0	8.631,0	11.446,0	11.267,0
BP Plc.	3.780,0	-6.482,0	115,0	3.389,0	9.383,0	4.026,0
Petrobras	-7.367,0	-8.450,0	-4.838,0	-91,0	7.173,0	10.151,0
Sinopec	7.563,0	5.215,6	7.013,4	7.602,7	9.298,1	8.327,2
CNOOC Ltd	9.798,2	3.247,9	95,7	3.661,2	7.948,6	8.846,0
Equinor ASA	3.453,5	-5.192,0	-2.922,0	4.590,0	7.535,0	1.843,0

Source: the authors.

It is interesting to note that in the research conducted by Abrahão, Carvalho e Marques, the same result was achieved. Through their financial performance analysis of the 10 main integrated companies in the oil and gas sector, in the period from 2010 to 2013, using these four categories of indicators it was observed that, as well as in the present research the sample obeyed similar growth

and reduction patterns in almost all categories analyzed over the four years, except for the quality of earnings, in which no consistent pattern was found.

This study was not intended to exhaustively compare the performance obtained by the companies, but only to show through the graphics exposed, the interpretation of the ratios obtained through the cash flow statement. It is noteworthy that the use of these ratios should complement the traditional ratios of measurement of ability to pay.

5 CONCLUSION

With accelerated growth and sudden changes in the economy, the search for accurate and reliable information has become essential in the financial and economic management of the companies, and it is essential to improve the analysis tools for the decision-making process on the quality of information. Thus, the analysts and managers seek new analysis instruments to support them in improvements and adjustments necessary to ensure the continuity of the company and maintenance of the business.

When used correctly, the Cash flow statement is an important ally for managers in making daily decisions that can affect the entire performance of the company, as it is possible to identify in advance the scarcity or excess of financial resources allowing for managers to make the most assertive decision considering the data presented.

Given this, the question that gave rise to this work emerged: how can the ratios selected through the cash flow statement be used in the analysis of liquidity and solvency of oil and gas companies?

Seeking to answer this question, were calculated and analyzed in this study some of the ratios obtained through the cash flow statement. For this analysis, four categories of ratios were used, namely: cash coverage, quality of earnings, capital expenditures, and cash flow return.

Related to the sample analyzed, it was selected the 10 largest Oil and Gas public companies with shares traded on the SEC that publish yearly their financial statements in 20-F or 10-K form, in the period from 2014 to 2019.

The data collected to calculate the ratios proposed in the study were obtained through the database of the Evaluate Energy website and were structured by the company, to enable the analysis of the behavior of cash flows through graphics based on excel spreadsheets.

Through the analysis, it was possible to see that the sample followed similar patterns of growth and reduction over the six years observed in almost all categories analyzed, for most companies, a fact that was not observed only to the quality of earnings ratio, for which no consistent pattern was perceived.

It was also noticed that 2014 and 2018 were the years in which the highest net income was obtained for most of the companies analyzed, and consequently the highest amounts of dividends paid to shareholders and the highest cash flow from operations results.

Most of the results of the companies analyzed are directly related to oil and gas exploration and production. Since purchases and sales of crude oil and petroleum products are related to international commodity prices, there are large exposures to price fluctuations, making companies' profitability, cash flow from operations, and financial condition highly dependent on crude oil and natural gas prices.

The variations observed in the result of the ratios over the years analyzed are fully justified by the fluctuations in the price of crude oil, due to the dependence on the price of the commodity. The rise in the price of crude oil in 2014 and 2018 pushed up the result of the ratios analyzed in this research in both years, as well as the drastic falls in the other years analyzed brought down the results of the ratios and company profits.

As for the specific objectives set out in this work, it can be observed that they were achieved, resulting in proof that a cash flow statement is an indispensable tool, as it demonstrates the inflows and outflows of values in the company's cash in a given period, assisting the short- or long-term financial planning and control.

In an earlier study by Abrahão, Carvalho, and Marques (2015) for the period from 2010 to 2013, for the same sector, with the same ratios used in this study, found the same result, since the sample obeyed similar growth and reduction patterns in almost all categories analyzed over the four years, except for the quality of earnings ratio, which no consistent pattern was found.

It was not the primary objective of this research to deepen the financial analysis of the ten companies or to compare them in-depth with their performances, but only to expose a methodology for calculating and interpreting ratios extracted from the cash flow statement.

It is important to state that the isolated analysis of these ratios is limited, even being applied over a long period. Another limitation in this work that is important to note is the possible differences in the classification of interest and dividends, paid and received, between IFRS and US GAAP, which could cause bias in performance comparisons.

For future research, is recommended the use of ratios obtained through the cash flow statement applied to other sectors of the economy, as well as research that compares the relevance of these indices with others obtained through the financial statements.

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