

Commodity Market Risk as a Determinant of Corporate R&D Investment*

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Abstract

The article addresses the problem of corporate R&D investment in the conditions of commodity market risk. The research goal was to determine the importance of the volatility of crude oil prices as a determinant of corporate R&D expenditures. The analysis was conducted on a group of companies representing the oil industry.

Research showed that the volatility of oil prices is an important determinant of the financial condition of R&D investment. The decline in oil prices led to reduced profitability and financial liquidity, indicating a deterioration in the financial condition of the analyzed companies. Simultaneously, an increase in R&D investments was observed. The opposite effect was identified during periods of growth. These trends were particularly clear in subperiods of dynamic trends in oil market.

Keywords: commodity market risk, R&D.

JEL codes: D81, G31

Introduction

Operating a business in the commodity market exposes companies to several additional types of risk. The first involves the volatility of commodity prices, and the second concerns fluctuations in the currency exchange rates used to settle commercial transactions. Both types of risk influence not only the economic and financial decisions made by companies but also the outcomes of those decisions particularly their overall economic and financial condition. The level of risk depends directly on the exposure faced by individual market participants, which may include factors such as sales revenues, operating costs, receivables, and liabilities.

The first of the aforementioned types of risk is price risk, also referred to as commodity risk. It is associated with the volatility of market prices for financial assets such as stocks, bonds, money market instruments, derivatives, and other securities. This type of risk also extends to non-financial assets traded on organized stock exchanges. Such assets, or commodities, are the subject of transactions conducted on commodity markets and typically include standardized goods that are either unprocessed or only minimally processed. Examples include industrial metals (e.g., copper, aluminium, zinc), precious metals (e.g., gold, silver, platinum), energy raw materials (e.g., crude oil, natural gas), and agricultural products such as coffee, cocoa, milk, and corn. In addition, intangible

commodities such as electricity and emission allowances for environmental pollution are also traded on these markets.

This type of risk is associated with the likelihood of unfavorable trends in commodity prices. It is an external phenomenon, largely beyond the control of the company (United Nations, 2019). Price risk reflects the uncertainty regarding future prices of goods bought or sold on the commodity market (CPA Australia, 2012). According to the consulting firm Deloitte (2018), price risk constitutes a component of the broader category of financial risk and is reflected in a company's financial performance including production costs, profitability, enterprise value, and creditworthiness. This definition highlights the significance of price risk and the wide range of financial management areas it influences.

Attention should also be given to the wide range of factors influencing the extent of commodity price fluctuations. These determinants are not only economic but also legal, technological, political, and environmental in nature. A key economic factor is the uncertainty surrounding demand, supply, and the level of inventories for individual commodities. This aspect becomes particularly significant during periods of economic downturn or crisis, when market price volatility tends to increase (Smales, 2017). Political conditions, such as the imposition of embargoes or import duties on specific raw materials, can also drive up prices in domestic markets. Furthermore, natural and climatic factors play an essential role—especially rainfall, temperature, and humidity levels. This category increasingly includes natural disasters such as floods, torrential rains, droughts, hailstorms, and hurricanes (Dubiel, 2014).

Another important factor is the phenomenon of force majeure, which includes events such as border blockades, wars, and terrorist attacks occurring in various regions of the world. The COVID-19 pandemic can also be classified as a force majeure event. Its negative consequences included a significant decline in the prices of goods traded on global commodity markets (United Nations, 2020), resulting from reduced activity across numerous economic sectors in countries affected by the pandemic.

Another important factor is price manipulation, which in the literature is defined as any action that distorts market prices. As a result, prices deviate from the levels determined by natural market mechanisms, leading to an inefficient allocation of resources. This phenomenon also affects commodity markets and, consequently, enterprises engaged in commercial transactions (Pirrong, 2017). Examples include action-based manipulation and information-based manipulation. In the former, a company engages in activities that misuse its assets to influence their value or the prices at which they are traded. In the latter, manipulation involves the dissemination of false or misleading information, causing price movements favorable to the party issuing the information (Allen and Gale, 1992).

Another factor is price speculation. For both individuals and financial institutions, commodities and related financial instruments are often viewed as alternative forms of capital investment. Speculative activities contribute to heightened volatility in commodity prices, often unrelated to fundamental market factors (Haase, Zimmermann and Zimmermann, 2016).

The examples discussed above illustrate the multitude of factors that influence commodity markets. The intensity and direction of these factors vary across different groups of commodities. It should be emphasized that the commodity market is characterized by relatively high price volatility significantly greater than that observed for instruments traded on money and capital markets, such as those listed on stock exchanges.

A key issue is the impact of this category of risk on the financial management of commodity-based enterprises. This relationship is reflected in various financial dimensions, including revenues, operating costs, operating profits (or losses), cash flows, particularly those from operating activities, and overall financial liquidity. Price risk also influences a company's level of indebtedness, capital structure, and enterprise value. Consequently, it affects the firm's overall financial condition, as well as its creditworthiness, market reputation, and even the likelihood of bankruptcy.

Of particular importance in this context is the transaction exposure of individual market participants. As mentioned earlier, this group includes suppliers, buyers, and entities that operate on both the supply and demand sides of the market. A company's market position determines the specific nature of its risk exposure, whether it

relates to revenues, costs, receivables, liabilities, or other financial components. For example, an increase in crude oil prices boosts the revenues and profitability of suppliers (extraction companies), while the same trend raises operating costs for buyers, such as refining companies, thereby reducing their profit margins.

The type of trade transactions also plays an important role. There are spot transactions and futures transactions based on derivatives (futures, forward). The increase in the volume of spot transactions is a factor increasing the risk of commodity price volatility. In turn, derivatives are instruments for reducing this kind of risk.

Corporate R&D investment in the conditions of commodity market risk

Both in economic theory and in business practice, R&D investments are regarded as one of the key factors determining a company's development, the effectiveness of undertaken economic initiatives, the ability to respond to changes in the environment, and, as a result, the improvement of its competitive and market position. They are also important for enhancing the innovativeness of enterprises, which seems to be of particular significance in the current conditions of rapid technical and technological progress (Szydłowski et al., 2020).

Many factors determine companies' R&D investments. Numerous studies indicate strong evidence supporting these determinants. Yang (2024) found that technological opportunities and demand-pull factors exerted the greatest influence on R&D decisions, while firm size also had a significant impact. Hua Cheng et al. (2006) analyzed the determinants of firm R&D investment from a resource-based perspective. They identified physical assets and R&D manpower resources as key factors.

Chang-Yang (2003) demonstrated that R&D investment is jointly influenced by demand-side and technology-side factors, with firm-specific technological capabilities playing a crucial role. Neves et al. (2020) observed that the determinants of R&D investment can vary across legal systems, underscoring the complexity of such decisions. Their analysis was based on a sample of European high-tech industries, encompassing countries with both civil law and common law traditions. The results indicated that the factors explaining the R&D ratio differ depending on whether the analysis concerns countries with a civil law or common law origin. Interestingly, the evidence also suggests that intangible assets, contrary to expectations, have a negative effect on R&D investment.

The focus of this article is commodity price volatility as a determinant of R&D investments. This is particularly relevant for companies that are indirect participants in this market, representing both the demand side (commodity buyers) and the supply side (commodity suppliers). One of the key aspects indicating this relationship is the impact of commodity price volatility on the financial condition of companies. Price trends affect revenues, costs, profitability, indebtedness, liquidity, and other aspects (Szydłowski et al. 2020). The problem is ambivalent because possible deterioration in financial condition reduces companies' investment capacity, including their ability to conduct R&D. On the other hand, high performance pressure drives the development and implementation of new technological solutions that enable cost reduction or production diversification. In this context, adverse market trends may serve as a stimulus to intensify such activities. This seems particularly relevant today, given the clearly visible negative impact of sudden market disruptions, as exemplified by the COVID-19 pandemic and the military conflict in Ukraine.

The issue is multifaceted. It relates not only to cost reduction (especially production costs) but also to create a competitive advantage for resource-based companies. The outcome of R&D investments may be solutions that enable the diversification of present companies activities, thereby facilitating entry into new markets. R&D activities can be reactive in nature, but they primarily may stem from forecasts regarding future price increases or decreases. Additionally, suppliers may use R&D activities to influence price policy, for example, by improving quality of their products.

The innovative activity of companies can be either procyclical or countercyclical with respect to commodity price volatility. Procyclicality arises from the fact that rising commodity prices translate into better financial performance, enhancing companies' investment capacity. This is further reinforced by increased access to financing sources, as well as a greater risk tendency among both- managers and shareholders. In contrast,

countercyclicality arises from firms' efforts to reduce costs and their pursuit of solutions in this regard through R&D. This provides companies with the opportunity to maintain profit margins and reduces the need to eliminate unprofitable fields of business.

An example can be companies represent the fuel industry. The main areas of R&D include, among others, the production of low-emission hydrogen, CO₂ emission reduction, biofuels, and Sustainable Aviation Fuel (SAF). They also encompass e-fuels and chemical synthesis, low-emission petrochemicals, chemical recycling, as well as digitalization and optimization of refineries.

The impact of oil price volatility on R&D investments by fuel companies has been the subject of numerous scientific studies. Particular attention is paid to the problem of uncertainty and its implication to the business management.

Nunes and Catalao-Lopes (2020) examined the effect of oil shocks on innovation in alternative energy sources. The findings indicated that the impact of oil prices on patent applications for alternative energies is asymmetric: declines in prices lead to a more pronounced reduction in innovation than the increase observed when prices rise.

Staine and Stone (2013) investigated the effects of uncertainty on various outcomes, including capital investment, hiring, R&D, and advertising. They found that uncertainty suppresses capital investment, hiring, and advertising, but stimulates R&D spending. This finding for R&D aligns with theoretical literature suggesting that long investment lags create valuable real options, which can offset the loss of call options when projects are initiated.

Amin et. al. (2023) explored the relationship between oil price uncertainty (OPU) and corporate innovation productivity. Using firm-level innovation data from US companies, they found that OPU is negatively associated with future innovation outcomes, measured by the number of patents, subsequent citations, and the monetary value of innovations. However, this negative effect is more pronounced for non-green innovation than for green innovation and is primarily driven by oil supply shocks.

Cao et. al. (2020) examined the impact of international oil price volatility on the investment behavior of renewable energy firms in China, highlighting the influence of oil price uncertainty on the sensitivity of investment to investment opportunities. Their analysis showed that oil price volatility strengthens the relationship between investment and investment opportunities, particularly for small firms and non-state-owned enterprises (non-SOEs), which are more likely to face financing constraints. Firm-specific factors, such as the debt-to-capital ratio and the cash flow-to-capital ratio, also play a significant role in shaping renewable energy firms' investment decisions.

Maghyereh and Abdoh (2020) examined the asymmetric effects of oil price uncertainty on corporate investment. They found that investment declines more sharply following volatility associated with positive oil price changes than with negative changes, and this asymmetric effect is more pronounced in small firms. Additionally, they observed that the asymmetry is stronger in crude oil- and gas-producing companies, where the impact of volatility from negative oil price changes exceeds that of positive changes.

Data and Empirical Results

The research included a group of oil companies. The analysis was performed for the period from January 2015 to December 2022. The subject of the research was the quotations of futures contracts for WTI crude oil, as well as the financial condition of companies.

Following ratios of financial performance were introduced:

- Liquidity – Quick Ratio, Current Ratio,
- Profitability – Pretax ROE, Pretax ROA,

The R&D investment were also analyzed. The following ratios were used:

- Amount of R&D investment,
- R&D investment/fixed assets,
- R&D investment/total assets.

The source of data regarding quotations of crude oil WTI futures contracts was pl.investing.com. Data on the companies' financial performance and R&D investment were obtained from the Thomson Reuters Refinitiv Eikon database.

The first aspect analyzed concerned WTI crude oil price quotations (Fig. 1).



Fig 1. WTI crude oil futures contract quotations for the period 2015–2022

The data indicate considerable volatility in crude oil prices over the analyzed period. The highest price was recorded on March 8, 2022 (USD 123.70), while the lowest occurred on April 21, 2020 (USD 10.01). Based on these observations, five subperiods can be distinguished.

Table 1: Research subperiods

Subperiod	Date	The situation in the crude oil market
I	01 January 2015 – 11 February 2016	subperiod of dynamic market decline
II	12 February 2016 – 03 October 2018	subperiod of mild, stable growth
III	04 October 2018 – 21 April 2020	subperiod of dynamic market decline, including a period of market collapse caused by the outbreak of the Covid-19 pandemic
IV	22 April 2020 – 17 July 2022	subperiod of dynamic growth
V	20 July 2022 – 30 December 2022	another subperiod of dynamic market decline

Each subperiod is characterized by distinct trends and dynamics in crude oil price volatility. Particularly noteworthy is Subperiod III, during which a sharp market collapse occurred. This was a result of the economic crisis triggered by the COVID-19 pandemic, making it a time of exceptionally challenging conditions for business activity.

The subsequent stage of the study involved assessing the financial condition of the analyzed companies. The analysis first focused on financial liquidity and profitability (Fig 2).

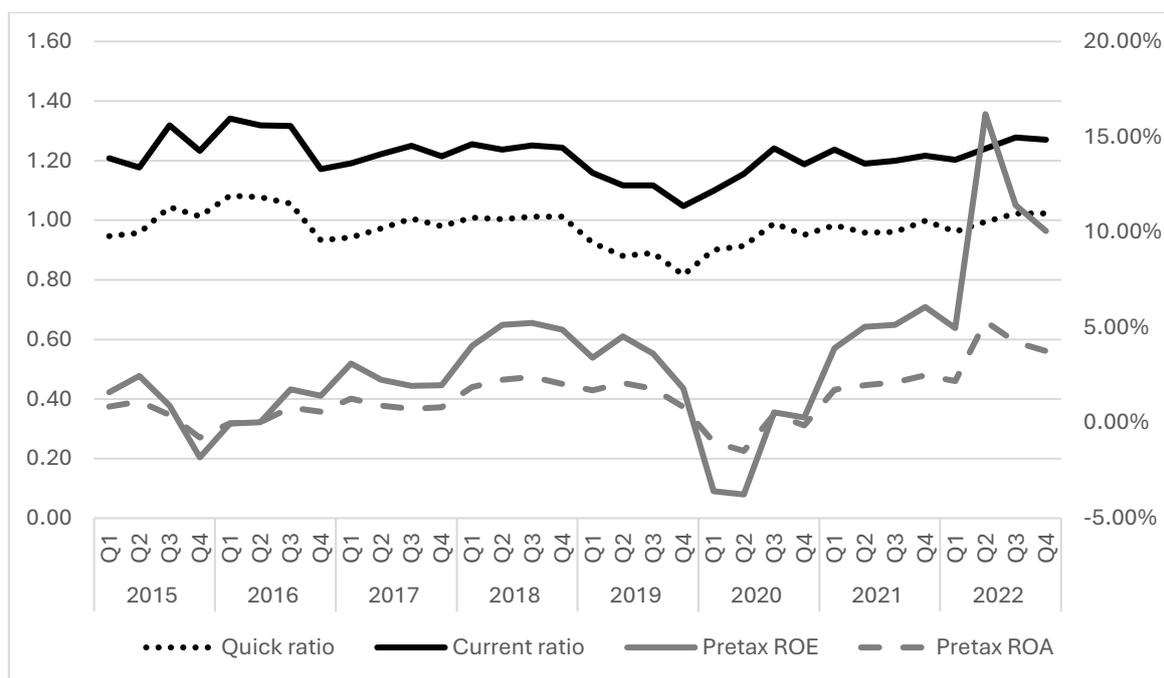


Fig 2. Mean of profitability and financial liquidity ratios for the period 2015-2022

The analyzed companies generally demonstrated a good financial condition. For most of them, liquidity ratios remained within standard levels. Only Exxon Mobil Corp and China Petroleum & Chemical Corp recorded ratios that appeared relatively low. It is also noteworthy that a decline in the average liquidity ratios was observed during the 2019–2020 period, coinciding with the outbreak of the COVID-19 pandemic and its adverse economic impacts.

The strong financial condition of the analyzed companies is further supported by profitability indicators, specifically Pretax ROE and Pretax ROA. The vast majority of enterprises reported positive profits, indicating effective utilization of their assets. The highest average Pretax ROE were recorded for Turkiye Petrol Rafinerileri AS (8.29%), and Ecopetrol SA (7.82%), while the lowest were observed for China Oilfield Services Ltd (0.32%) and Hess Corp (–0.85%). These findings are consistent with the results obtained for Pretax ROA.

A negative relationship was identified between oil prices trends and both profitability and liquidity. During subperiods of rising prices, a clear increase in these ratios was observed, whereas downturn phases were marked by declines. This pattern is typical, as the core activities of most analyzed companies involve oil extraction and distribution. A decrease in sales revenues reduces both profitability and liquidity, leading to a deterioration in overall financial condition. Conversely, during periods of price growth, higher revenues enhance profitability and operating cash flow, thereby improving the ability to meet current liabilities. It is worth noting that in the first half of 2020, most companies reported negative profitability indicators, confirming the severe deterioration of economic conditions caused by the COVID-19 pandemic and its adverse impact on financial performance.

Another element of the study was the analysis of the R&D investment. The following ratios were used:

- R&D investment,
- R&D investment/fixed assets,
- R&D investment/total assets.

Table 2: R&D investment in the period 2015-2022 (USD billion)

Companies	2015	2016	2017	2018	2019	2020	2021	2022
Aker BP ASA	76.1	147.5	225.7	295.9	305.5	174.1	353.0	242.2
BP	2 353.0	1 721.0	2 080.0	1 445.0	964.0	10 280.0	424.0	585.0
Chevron Corp	3 340.0	1 033.0	864.0	1 210.0	770.0	1537.000	549.0	974.0
Ecopetrol SA	546.3	240.9	450.7	467.2	230.0	186.7	252.9	342.5
Exxon Mobil Corp	1 523.0	1 467.0	1 790.0	1 466.0	1 269.0	1 285.0	1 054.0	1 025.0
Hess Corp	881.0	1 442.0	507.0	362.0	233.0	351.0	162.0	208.0
Imperial Oil Ltd	57.0	71.5	143.5	14.7	35.4	9.8	25.4	3.9
Marathon Oil Corp	971.0	323.0	409.0	289.0	149.0	181.0	44.0	45.0
OMV AG	814.2	938.2	252.1	206.1	255.1	1 034.5	326.8	258.8
Shell PLC	6 812.0	3 122.0	2 867.0	2 326.0	3 316.0	2 654.0	2 239.0	2 788.0
China Petroleum & Chemical Corp	1 666.1	1 656.1	2 033.6	2 818.1	2 881.2	2 880.2	3 702.8	3 477.5
Turkiye Petrol Rafinerileri AS	8.3	8.1	4.1	4.3	4.2	3.1	2.5	3.6
Total R&D expenditures	19 048.1	12 170.2	11 626.6	10 904.3	10 412.3	19 039.3	9 135.4	9 953.4

The period 2015-2022 was characterized by variation in R&D investments. The highest expenditures were observed in 2015 and 2020, while the lowest in 2021–2022. The total value of R&D investments over the entire analyzed period amounted to USD 103.8 bn. The highest amounts were generated by the companies: Shell PLC (26.1 bn USD), China Petroleum & Chemical Corp (21.1 bn USD), and BP (19.9 bn USD).

The dynamics of investment also varied. The highest level was observed in 2020 (197.6). However, it should be emphasized that this was mainly due to a significant increase in expenditures by BP. In turn, the lowest dynamics (44.4) occurred in 2021.

The results reveal a fairly significant negative relationship between the level and dynamics of R&D expenditures and the trends in crude oil price. Significantly higher levels of investments were observed during periods of marked crude oil price declines (2015 and 2020). In contrast, periods of rising prices, namely 2016–2019 and 2021–2022, were characterized by a downward trend in expenditures.

Another aspect analyzed was the R&D investment/total assets ratio, calculated for individual companies.

Table 3: R&D investment/total assets ratio in the period 2015-2022 (%)

Company	2015				2016				2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Aker BP ASA	0.27	0.47	0.34	0.36	0.67	0.65	0.30	0.48	0.32	0.81	0.70	0.47
BP	0.06	0.32	0.13	0.35	0.10	0.13	0.31	0.12	0.16	0.32	0.11	0.19
Chevron Corp	0.22	0.40	0.12	0.51	0.14	0.08	0.10	0.07	0.06	0.05	0.09	0.14
Ecopetrol SA	0.07	0.21	0.20	0.83	0.06	0.21	0.08	0.24	0.02	0.07	0.28	0.77
Exxon Mobil Corp	0.09	0.11	0.10	0.15	0.15	0.10	0.13	0.10	0.10	0.10	0.08	0.15
Hess Corp	0.75	0.25	0.39	1.11	0.38	0.58	0.23	3.61	0.21	0.19	0.15	1.54
Imperial Oil Ltd	0.04	0.04	0.04	0.05	0.04	0.10	0.04	0.05	0.05	0.00	0.02	0.37
Marathon Oil Corp	0.26	0.31	1.69	0.57	0.07	0.56	0.26	0.11	0.11	0.12	1.28	0.26

OMV AG	0.19	0.34	1.08	0.61	0.13	2.17	0.21	0.23	0.10	0.19	0.12	0.30
Shell PLC	0.31	0.34	1.08	0.25	0.17	0.19	0.19	0.21	0.16	0.12	0.13	0.29
China Petroleum & Chemical Corp	0.19	0.23	0.10	0.21	0.15	0.18	0.17	0.26	0.15	0.15	0.34	0.28
Turkiye Petrol Rafinerileri AS	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
Mean	0.21	0.25	0.44	0.42	0.17	0.41	0.17	0.46	0.12	0.18	0.28	0.40
Median	0.19	0.28	0.16	0.36	0.14	0.18	0.18	0.16	0.11	0.12	0.13	0.29
	2018				2019				2020			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Aker BP ASA	0.46	0.62	0.76	0.68	0.81	0.52	0.60	0.69	0.43	0.42	0.26	0.34
BP	0.19	0.06	0.11	0.16	0.13	0.05	0.06	0.09	0.07	3.68	0.07	0.08
Chevron Corp	0.06	0.07	0.24	0.10	0.07	0.06	0.07	0.11	0.07	0.40	0.05	0.15
Ecopetrol SA	0.06	0.10	0.81	0.16	0.05	0.20	0.05	0.28	0.03	0.09	0.07	0.28
Exxon Mobil Corp	0.08	0.20	0.08	0.10	0.08	0.15	0.08	0.09	0.08	0.10	0.08	0.06
Hess Corp	0.18	0.29	0.79	0.42	0.16	0.20	0.23	0.49	0.91	0.16	0.37	0.32
Imperial Oil Ltd	0.02	0.00	0.01	0.01	0.08	0.0	0.01	0.01	0.00	0.01	0.01	0.02
Marathon Oil Corp	0.24	0.30	0.26	0.54	0.28	0.12	0.11	0.21	0.14	0.14	0.14	0.56
OMV AG	0.11	0.16	0.07	0.16	0.12	0.18	0.10	0.18	0.28	0.19	1.58	0.09
Shell PLC	0.11	0.12	0.13	0.22	0.13	0.16	0.22	0.31	0.14	0.25	0.12	0.19
China Petroleum & Chemical Corp	0.14	0.39	0.24	0.37	0.25	0.24	0.23	0.41	0.19	0.30	0.27	0.35
Turkiye Petrol Rafinerileri AS	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
Mean	0.14	0.19	0.29	0.24	0.18	0.16	0.15	0.24	0.20	0.48	0.25	0.20
Median	0.11	0.14	0.19	0.16	0.12	0.16	0.09	0.19	0.11	0.17	0.10	0.17
	2021				2022							
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Mean	Median		
Aker BP ASA	0.58	0.78	0.72	0.49	0.32	0.18	0.24	0.09	0.49	0.47		
BP	0.04	0.04	0.04	0.04	0.03	0.04	0.08	0.05	0.23	0.09		
Chevron Corp	0.04	0.05	0.07	0.08	0.08	0.08	0.04	0.18	0.13	0.08		
Ecopetrol SA	0.12	0.05	0.12	0.18	0.04	0.18	0.04	0.29	0.19	0.12		
Exxon Mobil Corp	0.06	0.18	0.05	0.05	0.05	0.14	0.05	0.08	0.10	0.09		
Hess Corp	0.17	0.25	0.18	0.22	0.22	0.16	0.27	0.34	0.49	0.26		
Imperial Oil Ltd	0.01	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.03	0.01		
Marathon Oil Corp	0.03	0.02	0.09	0.12	0.02	0.01	0.16	0.06	0.29	0.15		
OMV AG	0.08	0.08	0.08	0.28	0.02	0.13	0.09	0.18	0.31	0.17		
Shell PLC	0.12	0.13	0.16	0.14	0.11	0.14	0.15	0.24	0.21	0.16		
China Petroleum & Chemical Corp	0.26	0.32	0.33	0.40	0.30	0.30	0.23	0.31	0.26	0.25		
Turkiye Petrol Rafinerileri AS	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01		
Mean	0.13	0.16	0.15	0.17	0.10	0.11	0.11	0.15	X	x		
Median	0.07	0.06	0.09	0.13	0.04	0.14	0.09	0.13	X	x		

The analyzed enterprises were characterized by very different levels of the ratio. The highest median was observed for Aker BP ASA, Hess Corp, and China Petroleum & Chemical Corp. In turn the lowest was for Imperial Oil Ltd, and Turkiye Petrol Rafinerileri AS. Similar results were obtained from the analysis of the mean. Complementing the data in Table 2 is an analysis of the mean and median of the indicators on an annual basis. The data are presented in Figure 3.

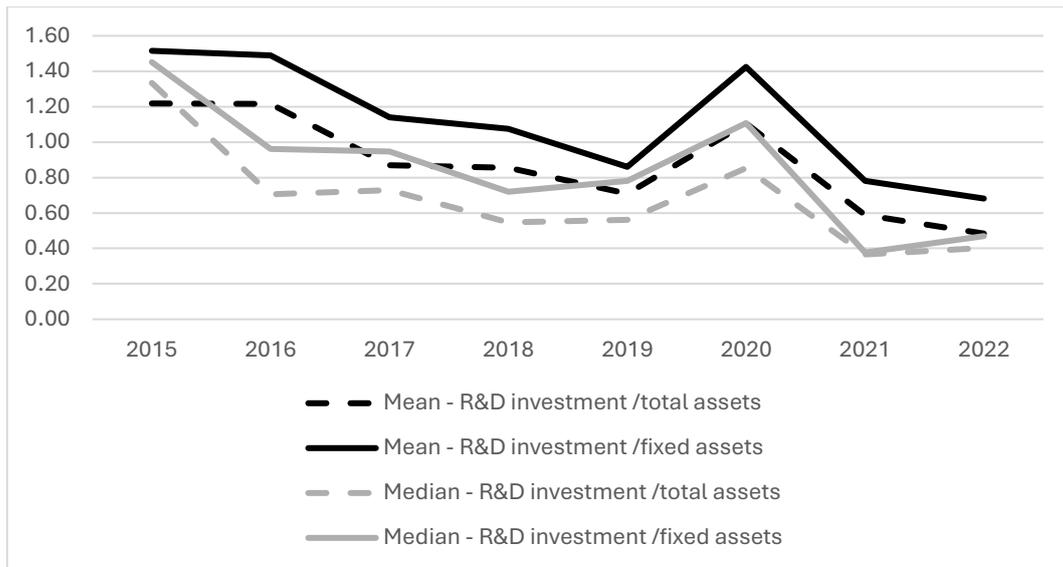


Fig 3. Mean and median of ratios - R&D investment/fixed assets and R&D investment/total assets

The results of the analysis confirm the observations noted in the earlier part of study. The highest values were observed in 2015, corresponding to a period of a marked decline in oil prices. A similar phenomenon occurred in 2020. In contrast, a clear downward trend was observed during 2016–2019, which, as mentioned earlier, was a period of rising crude oil prices. Similar trends were also noted in the 2021–2022 subperiod.

The analysis of R&D investments in the context of companies' financial condition also provides interesting insights. The numerical data indicate a clear negative relationship between profitability (Pretax ROA and Pretax ROE) and the level of investment expenditures. During periods of deteriorating financial performance, companies' investment activity increases. Conversely, the opposite pattern is observed during periods of rising profitability. Similar observations emerge from the analysis of indebtedness. The highest mean of the debt-to-equity ratio was observed in 2015 (1.20) and 2020 (1.01). Only in these years did the ratio exceed 1, indicating the dominance of debt over equity. These were also periods of increased innovative activity of the companies. Conversely, lower levels of debt were accompanied by reduced R&D expenditures. A possible explanation for this situation is that a deterioration in financial condition stimulates efforts to seek out and implement solutions that improve companies' efficiency and competitiveness.

Conclusions

Działalność R&D jest jednym z ważnych obszarów zarządzania biznesem. Decyzje w tym obszarze wpływają na innowacyjność, konkurencyjność, jak też kondycję finansową i wartość przedsiębiorstw. Pozwalają również zredukować ryzyko biznesowe oraz dywersyfikować działalność gospodarczą. There are many factors determining the R&D investment - external and internal. One of them is commodity price risk, which particularly is related to companies related to the oil industry.

The article deals with the problem of commodity market risk as a determinant of R&D investment. The scope of the research included crude oil price quotations, financial condition of companies, and R&D activity.

The study indicated that oil price volatility has a significant impact on the financial condition of companies. The observed upward trends in oil prices led to improvements in liquidity and profitability, whereas a decline caused a deterioration in financial performance. Oil price volatility was also reflected in the companies' R&D activity. The increase in investment was observed for periods of decline in oil prices. The opposite situation occurred during periods of price increases, resulting in decreasing R&D expenditures.

The research seems to confirm that the volatility of oil prices should be taken as an important determinant of the R&D investment. It can also create a significant risk, reflected not only in downward market trends but also in the

magnitude of short-term oil price fluctuations. It may negatively impact a company's financial condition, and in consequence on R&D investment. It is therefore crucial to adapt strategies and implement measures to mitigate this type of risk.

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