



## INTEGRATION OF BUSINESS INTELLIGENCE TOOLS IN ENERGY SECTOR ANALYSIS

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**Abstract:** *Lucrarea prezintă modul în care instrumentele de Business Intelligence, în special Microsoft Power BI, pot fi integrate în analiza performanței economico-financiare a companiilor din sectorul energetic. Studiul de caz realizat pe compania Romgaz S.A. evidențiază utilizarea combinată a aplicațiilor Excel și Visual Basic for Applications (VBA) pentru calculul automat al indicatorilor financiari și bursieri, precum și integrarea acestor rezultate într-un tablou de bord interactiv în Power BI. Cercetarea demonstrează utilitatea BI în facilitarea procesului decizional, prin vizualizări dinamice, transparente și orientate spre performanță.*

**Cuvinte cheie:** *Business Intelligence, Power BI, analiză financiară, sector energetic, Romgaz*

**Abstract:** *The paper presents how Business Intelligence tools, especially Microsoft Power BI, can be integrated into the economic and financial analysis of companies in the energy sector. A case study on Romgaz S.A. highlights the combined use of Excel and Visual Basic for Applications (VBA) for the automatic calculation of financial and stock market indicators and the integration of these results into an interactive Power BI dashboard. Research demonstrates the usefulness of BI in supporting managerial decision-making through dynamic, transparent and performance-oriented visualizations*

**Keywords:** *Business Intelligence, Power BI, financial analysis, energy sector, Romgaz*

**JEL Classification:** C88, M15, L95

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## 1 INTRODUCTION

In an economic context characterized by accelerated digitalization and the growing need for efficiency in data processing, the use of Business Intelligence (BI) tools has become an essential component of modern managerial activity. The energy sector, due to its complexity and volatility, requires an advanced analytical approach to assess the performance of companies and to support strategic decision-making processes.

This paper aims to highlight the integration of modern IT tools – especially Power BI and Visual Basic for Applications (VBA) – in the financial-accounting analysis process of energy companies in Romania. The case study on the National Gas Company Romgaz S.A. demonstrates how the combination of process automation in Excel and interactive visualization in Power BI can transform raw data into relevant information for decisions.

The digitization of financial analysis is no longer a simple option, but a necessity. BI tools provide an integrated framework in which the analysis of performance, risk and stock market evolution can be carried out in real time, with high accuracy and a high degree of interactivity.

## 2 DEFINITION OF THE RESEARCH PROBLEM

The research problem is **to identify how Business Intelligence tools can improve the analysis of the economic and financial performance** of companies in the energy sector, characterized by large volumes of data, multiple information sources and a high dynamic of stock market indicators.

## 3 RESEARCH OBJECTIVES

The main objectives of the research are:

- Automation of the calculation of financial indicators (profitability, liquidity, solvency) through VBA in Excel;
- Integration of data from multiple sources into a unitary analysis model;
- Building an interactive dashboard in Power BI for graphical interpretation of indicators;
- Comparison of Romgaz's performance with other relevant companies in the energy sector (OMV Petrom, Electrica, Transelectrica, Transgaz);
- Demonstrating the added value of BI in supporting strategic decisions.

### 3.1 RESEARCH HYPOTHESIS

The hypothesis from which it was started is that the use of Business Intelligence tools (Excel-VBA + Power BI) increases **the accuracy, speed and interpretative capacity** of the financial analysis process, facilitating data-driven decisions.

### 3.2 RESEARCH METHODOLOGY

The research was carried out in three stages:



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1. **Collection of data** from official sources (Bucharest Stock Exchange, Romgaz annual reports, MFP);
2. **Automating calculations** in Excel using VBA for indicators such as ROE, ROA, ROS, current liquidity, leverage ratio, etc.;
3. **Integration into Power BI**, where dynamic visualizations and comparative analysis between companies were carried out.

The method used combines quantitative analysis (through automatic calculations) with visual analysis (through graphical representations), ensuring a complete perspective on economic performance.

## 4. PRESENTATION OF RESEARCH RESULTS

### 4.1 Case study: Romgaz S.A.

Romgaz is the leader of the Romanian natural gas market, having a strategic role in national energy security. The company is listed on the Bucharest Stock Exchange and the London Stock Exchange, and the financial analysis covers the period **2015–2024**.

The data were collected from public sources and structured in separate spreadsheets (Balance Sheet, Profit and Loss Account, Cash Flows, Indicators). Through VBA codes, indicator calculations were fully automated, which allowed for the rapid generation of uniform and accurate data series.

### 4.2 Automating financial indicators via VBA

For the analysis of Romgaz and comparable companies, VBA macrocommands were implemented dedicated to the calculation of performance indicators, operational indicators, risk indicators, solvency indicators, such as:

- **$ROA = \text{Net Profit} / \text{Total Assets} \times 100$**
- **$ROE = \text{Net profit} / \text{Equity} \times 100$**
- **$ROS = \text{Net Profit} / \text{Turnover} \times 100$**
- **$\text{Indebtedness} = \text{Total Liabilities} / \text{Total Assets} \times 100$**
- **$\text{EBIT} = \text{Gross Profit} - \text{Total Financial Expenses} + \text{Total Financial Income}$**
- **$\text{EBITDA} = \text{EBIT} + \text{depreciation}$**
- **$\text{Quick Liquidity} = (\text{Total Current Assets} - \text{Stocks}) / \text{Short-Term Liabilities}$**
- **$\text{Overall solvency} = \text{Total assets} / \text{Total liabilities}$**

These VBA procedures were adapted for each company analysed and the results were centralised in a summary sheet ('Calculated Indicators – VBA'). By running macros, the user can simultaneously update all the metrics for all years and all companies.

**Figure no.1 - VBA code used to calculate the ROA indicator, for all companies, for all analyzed years 2015-2024**

```

Under CalculeazaROA_Multipla_RO()

Dim SheetResults As Worksheet
Dim SheetBalance sheet as a worksheet
Dim SheetPP as Worksheet
Dim RandAn As Long ' Variable for the column representing the year
Dim VenitNet as double
Dim TotalActive as double
Dim ROA value as double

' We define the result sheet
ResultSheet Set = ThisWorkbook.Sheets("VBA CALCULATION INDICATORS")

' We clean up any previous results in the B:K columns for the relevant rows
'The results by years will be in columns B, C, D, E, F, G, H, I, J, K
ResultSheet.Range("B2:K2"). ClearContents ' OMV-PETROM
ResultsSheet.Range("B16:K16"). ClearContents ' ELECTRICA
ResultSheet.Range("B29:K29"). ClearContents ' TRANSELECTRICA
ResultSheet.Range("B42:K42"). ClearContents ' ROMGAZ
ResultSheet.Range("B59:K59"). ClearContents ' TRANSGAZ
' Here we will iterate for each company
Each 10-year-old group will start from column B to K (Year 1 is B, Year 2 is C, etc.)
' -----
OMV-PETROM
' -----
PP Sheet Set = ThisWorkbook.Sheets("OMV-PETROM PP ACCOUNT") ' Sheet Name for PP Account
Balance sheet set = ThisWorkbook.Sheets("OMV-PETROM BALANCE SHEET") ' Sheet name for the
balance sheet
' Years are in columns and start from column B (e.g. 2015 in B, 2016 in C, etc.)
For RandAn = 2 to 11' Columns B, C, D, E, F, G, H, I, J, K
    VenitNet = SheetPP.Cells(16, RandAn). Value ' Line 16 for Net Income
    TotalActive = SheetBalance.Cells(12, RandAn). Value ' Line 12 for Total Assets
    If TotalActive > 0 then
        ROA Value = (NetRevenue / TotalAssets) * 100' ROA in Percent
    
```



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```
Otherwise
    ROA value = 0 ' Avoid division to zero
End if
SheetResults.Cells(4, RandAn). Value = Format(ROAVALUE, "0.00%") ' Line 4 for OMV-PETROM
Next RandYear
' -----
' ELECTRIC
' -----
PP Sheet Set = ThisWorkbook.Sheets("ELECTRIC PP ACCOUNT")
Balance Sheet Set = ThisWorkbook.Sheets("ELECTRICAL BALANCE")
For RandAn = 2 to 11
    VenitNet = SheetPP.Cells(16, RandAn). Value
    TotalActive = SheetBalance.Cells(12, RandAn). Value
    If TotalActive <> 0 then
        ROA Value = (NetRevenue / TotalAssets) * 100
    Otherwise
        ROA value = 0
    End if
    SheetResults.Cells(18, RandAn). Value = Format(ROAValue, "0.00%") ' Line 18 for ELECTRICA
Next RandYear
' -----
' TRANSELECTRICA
' -----
Set of PP Sheets = ThisWorkbook.Sheets("TRANSELECTRICA PP ACCOUNT")
Set SheetBalance = ThisWorkbook.Sheets("TRANSELECTRIC BALANCE")
For RandAn = 2 to 11
    VenitNet = SheetPP.Cells(16, RandAn). Value
    TotalActive = SheetBalance.Cells(12, RandAn). Value
    If TotalActive <> 0 then
        ROA Value = (NetRevenue / TotalAssets) * 100
    Otherwise
        ROA value = 0
    End if
    SheetResults.Cells(31, RandAn). Value = Format(ROAValue, "0.00%") ' Line 31 for TRANSELECTRICA
Next RandYear
' -----
```

```
' ROMGAZ
' -----

Set SheetPP = ThisWorkbook.Sheets("ROMGAZ PP ACCOUNT")
Set SheetBalance = ThisWorkbook.Sheets("ROMGAZ BALANCE")
For RandAn = 2 to 11
    VenitNet = SheetPP.Cells(16, RandAn). Value
    TotalActive = SheetBalance.Cells(12, RandAn). Value
    If TotalActive <> 0 then
        ROA Value = (NetRevenue / TotalAssets) * 100
    Otherwise
        ROA value = 0
    End if
    ResultsSheet.Cells(44, RandAn). Value = Format(ValueROA, "0.00%") ' Line 44 for ROMGAZ
Next RandYear
' -----
' TRANSGAZ
' -----

PP Sheet Set = ThisWorkbook.Sheets("TRANSGAZ PP ACCOUNT")
Set SheetBalance = ThisWorkbook.Sheets("TRANSGAZ BALANCE")
For RandAn = 2 to 11
    VenitNet = SheetPP.Cells(16, RandAn). Value
    TotalActive = SheetBalance.Cells(12, RandAn). Value
    If TotalActive <> 0 then
        ROA Value = (NetRevenue / TotalAssets) * 100
    Otherwise
        ROA value = 0
    End if
    SheetResults.Cells(61, RandAn). Value = Format(ROA Value, "0.00%") ' Line 61 for TRANSGAZ
Next RandYear
MsgBox "The ROA calculation has been completed for all companies! The results can be found in the sheet
'INDICATORS CALCULATE VBA'.", vbInformation
End Under
```

*Source: the author*

Similarly, the rest of the indicators were calculated, using the calculation formulas appropriate to each type of indicator.



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To complete the financial picture, the following stock market indicators were also calculated, based on the data available in the companies' annual reports.

- **P/E ( Price to Earning Ratio)** – the ratio of market capitalization to net profit
- **P/S (Price To Sales)** – the ratio between market capitalization and turnover
- **P/BV (Price to Book Value)** – the ratio between market capitalization and equity
- **P/CF (Price to cash flow)** – the ratio of market capitalization to operating cash flow

**Figure no.2-VBA code used for calculating stock market indicators, for all companies, for all analyzed years 2015-2024**

*Under CalculateStock Indicators()*

*Dim wsIndicatorsStocks as a worksheet*

*Dim wsContProfit as a worksheet*

*Dim wsBalance Sheet as Worksheet*

*Dim wsFlux as a worksheet*

*Dim wsIndicatorsCalculative as a worksheet*

*Dim capitalizationStock market Ca double*

*Decrease net profit by double*

*Dim figureBusiness As Double*

*Dim equityEquity as double*

*Dim fluxNumer As Double*

*Dim PER as double*

*Dim PS as double*

*Dim PBV as double*

*Dim PCF As Variant' we use Variant to be able to display "N/A" if the stream is zero*

*Dim i as a whole*

*Dim colStart as whole*

*' Setting references to sheets*

*Set wsIndicatorsScholarships = Worksheets ("Scholarship Indicators")*

*Set wsProfitAccount=Worksheets("profit and loss account")*

*Set wsBalance = Worksheets("Balance")*

*Set wsFlux = Worksheets("Cash Flows")*

*Set wsCalculativeIndicatorsba = Worksheets("Calculated-vba Indicators")*

*colStart = 2 ' Column B = 2*

```

For i = 0 To 9 'for 10 years: B, C, D, E, F, G, H, I, J, K,
    ' Taking over the values for each year
    CapitalizationStock = wsIndicatorsStocks.Cells(2, colStart + i). Value
    profitNet = wsContProfit.Cells(16, colStart + i). Value
    turnkey = wsProfitAccount.Cells(2, colStart + i). Value
    equityEquity = wsBalance.Cells(24, colStart + i). Value
    fluxNumerarFromExploitation = wsFlux.Cells(2, colStart + i). Value

    ' P/E Calculation (Price/Earnings Ratio)
    If profitNet <> 0 then
        P/E = Market Capitalization / Net Profit
    Otherwise
        PER = 0
    End if

    ' P/S Calculation (Price/Sales Ratio)
    If the turnover <> 0 Then
        PS = Market capitalization / turnoverBusiness
    Otherwise
        PS = 0
    End if

    ' Calculation P/BV (Price/Book Value Ratio)
    If equityEquity <> 0 then
        PBV = Market capitalization / equityEquity
    Otherwise
        PBV = 0
    End if

    ' Calculation of P/CF (Price/Cash Flow Ratio)
    If Cash Flow <> 0 Then
        PCF = Market capitalization / CashFlowFromOperation
    Otherwise
        PCF = "N/A"
    End if

    ' Writing indicators in the "Calculated indicators-vba" sheet
    With wsIndicatorsCalculativba
        . Cells(13, colStart + i). Value = P/E
        . Cells(14, colStart + i). Value = PS
        . Cells(15, colStart + i). Value = PBV
    End With

```





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. Cells(16, colStart + i). Value = PCF

End with

Next i

MsgBox "Indicators have been calculated and displayed in the 'Calculated Indicators' sheet."

End Under

Source:the author

Automation has reduced processing time by more than 70% and eliminated errors generated by manual entry.

### 4.3 Integrating Power BI into energy sector analysis

The essential part of the research is **the integration of financial and stock market results into a Power BI dashboard**. It provides a visual, interactive and comparable picture of the performance of companies in the energy sector.

#### Key elements of the Power BI dashboard:

- **Page 1:** the evolution of revenues, expenses, net profit, balance sheet statement (assets, liabilities, equity), the statement of Romgaz's cash flows, as well as the values of the relevant indicators (2015–2024); the year 2023 is selected in the image, but you can view any year you want, the picture being dynamic and the data being transformed according to the selected year.

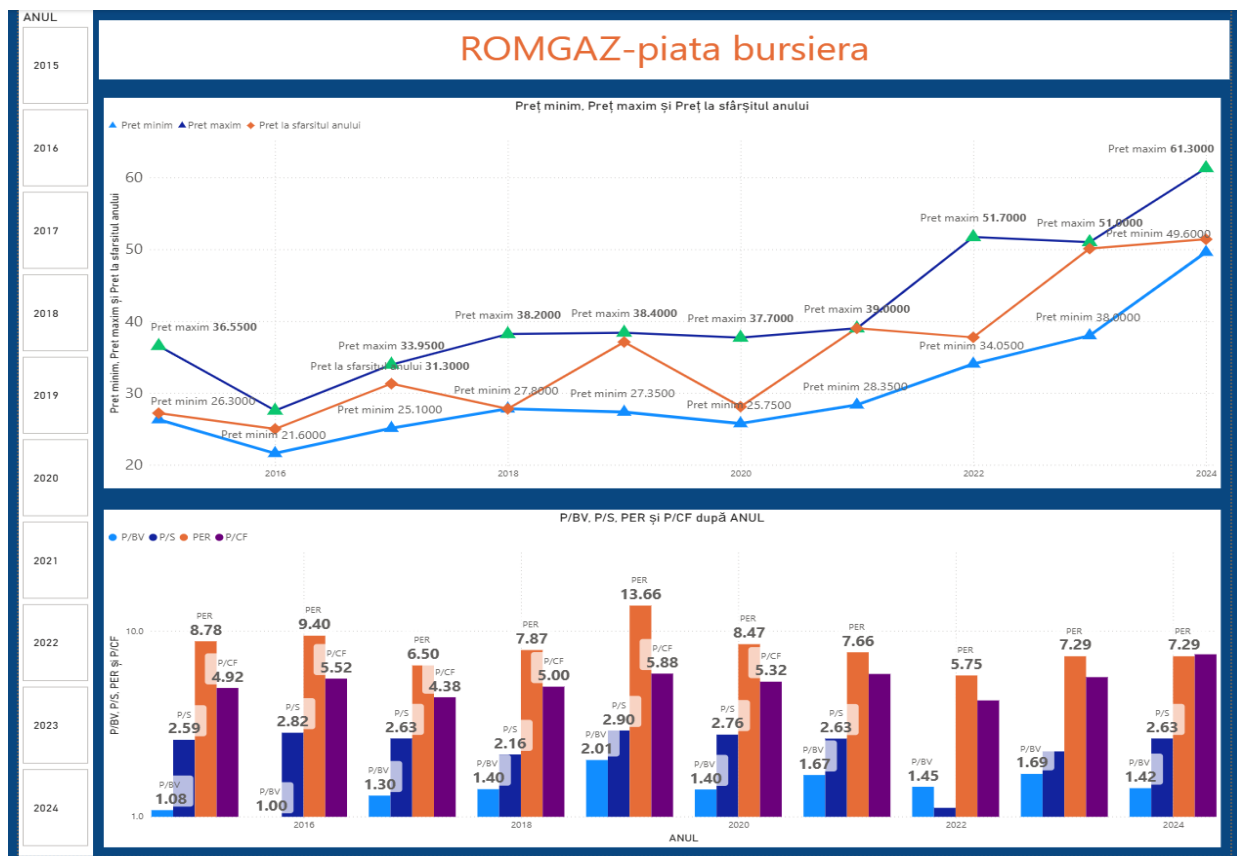
Figure no.3 – First page of the dashboard made with Power BI for Romgaz



Source: the author

- **Page 2:** stock market indicators (PER, P/BV, P/S, P/CF) with dynamic charts, as well as stock prices (minimum, maximum price and price at the end of the year) for Romgaz; you can also use the overall chart version for all the analyzed years or you can choose the individual visualization option for each year.
- **Page 3:** is a continuation of the stock market analysis presented on page 2 and represents the net earnings per share, gross dividend per share and dividend yield.

**Figure no.4-Page 2 of the dashboard created with Power BI, represents the stock market indicators and the stock price**



Source: the author

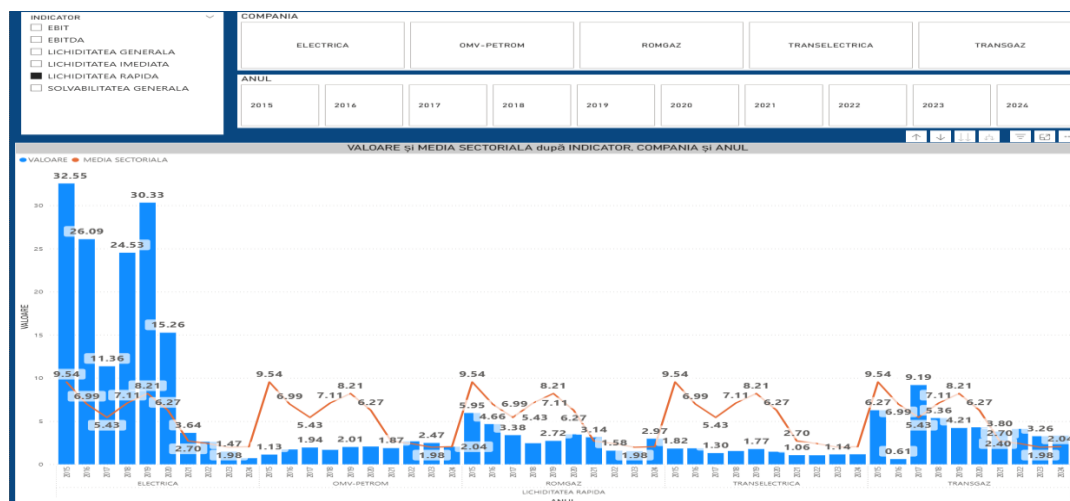
- **Page 4:** comparative analysis between companies (Romgaz vs. OMV Petrom, Electrica, Transelectrica, Transgaz), regarding operational indicators, risk and solvency indicators. This page can be viewed both by individual company and comparatively for each indicator.

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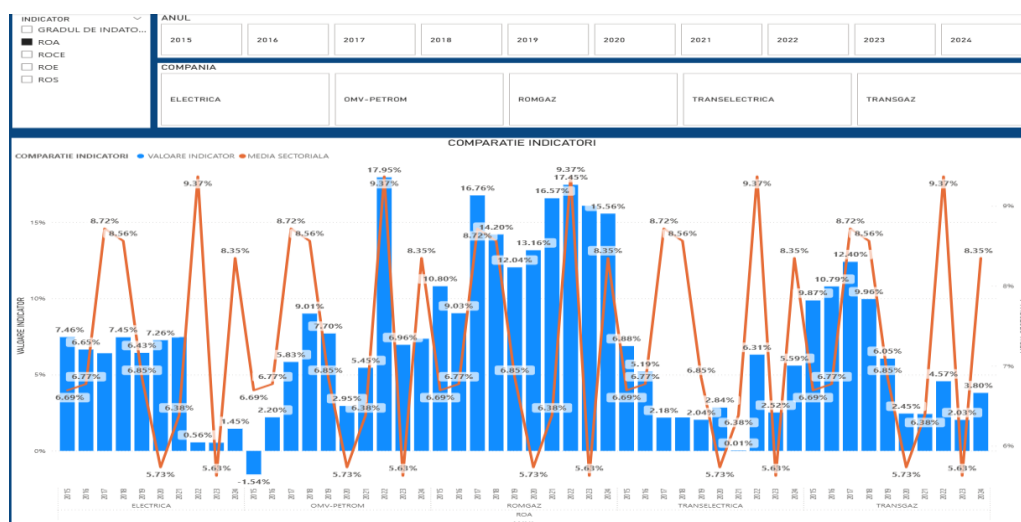
**Figure no.5-Page 4 of the dashboard created with Power BI that represents a comparison of operational, risk and solvency indicators, for all 5 companies analyzed**



Source: the author

- **Page 5:** represents a comparison of the profitability indicators and the degree of indebtedness between the companies Romgaz, Electrica, Transelectrica, Transgaz and OMV-Petrom, as well as a comparison with the average for this sector.

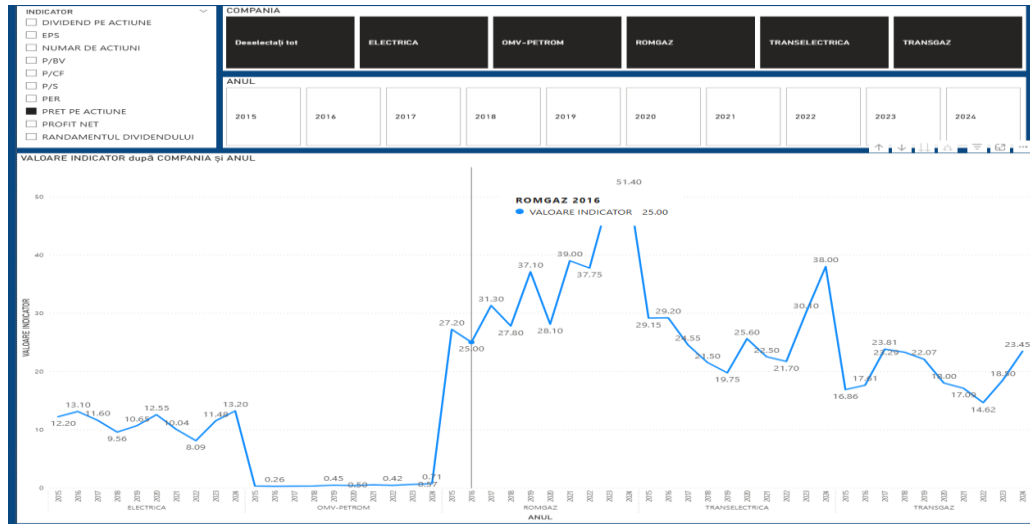
**Figure no.6- Page 5 of the dashboard made with Power BI, represents a comparison of profitability indicators and the degree of indebtedness and a comparison with the average by sector**



Source: the author

- **Page 6 -** represents a comparison of stock market indicators between companies

**Figure no.7-Comparison of stock market indicators both at the level of companies and at the level of the analyzed year**



Source: the author

Power BI allows you to filter data by year, company, and indicator, generating interactive line chart, clustered column chart, and card visuals for synthetic metrics. By linking directly to Excel files, updating indicators in Power BI is done automatically, without re-entering data. This integration is a concrete example of the digitization of financial analysis in the real economic environment.

#### 4.4 Analysis results

The results obtained confirm the research hypothesis:

- Power BI makes it easy to visualize and interpret metrics at the same time;
- Romgaz recorded a constant increase in profitability during the analyzed period, with an average ROE of over 10%;
- Stock market indicators show a higher stability than the sector average, thanks to a solid financial structure and a high market capitalization;
- BI tools contribute significantly to streamlining decision-making in large energy companies, providing management with a complete and up-to-date picture of performance.

### 5. CONCLUSIONS

The integration of Business Intelligence tools, especially Power BI, in the financial and accounting analysis of companies in the energy sector offers significant benefits: automation, interactivity, accuracy and transparency in the decision-making process. The paper demonstrates that the synergy between Excel (VBA) and Power BI transforms classic analytics into an intelligent reporting system. In the case of Romgaz, this system allowed:



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- rapid assessment of financial performance;
- comparative analysis with other companies in the sector;
- identifying trends and areas of risk;
- visual presentation of results for management and investors.

The limitations of the research derive from the dependence on the quality of public data and the lack of direct integration with external financial databases. However, the extension of the proposed model may aim at **the complete automation of the data flow and integration into ERP systems**. Future research directions include applying the methodology to other economic sectors, such as banking or public services, and developing predictive reports based on artificial intelligence in Power BI.

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