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Using Artificial Intelligence to Improve the Efficiency of the Market Valuation Method

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Abstract

Purpose: Advances in technology inevitably come with new potential methods for performing already established activities. Artificial intelligence, in turn, is one of the most talked-about technological innovations. Its impact on the financial sphere is still being analyzed and explored. This article examines the effect of these tools on the established market valuation methodology. The purpose of this paper is to show how digitalization and improvements in the usage of new digital technologies could prove to be useful in increasing the efficiency of already established processes such as the selected methodology for enterprise valuation: The Market approach. More specifically it focuses on artificial intelligence as a tool which can be used to improve said efficiency.
Design/Methodology/Approach: The research method used in this paper is a case study, based on a practical execution of the chosen valuation method in three different scenarios, which differ depending on the usage of AI technologies. All of the executions of the methodology are timed using a stopwatch. A subsequent comparison of results is carried out, based on the findings, and the three executions are analyzed based on speed, accuracy of results, relevancy of results and relevancy of peers.
Findings: The analysis displayed a concrete result, in which the AI used, although proving to be extremely useful in shortening the execution time of the chosen valuation method, the accuracy of the results provided by it remained very far from the truth, as is the relevance of the peers provided by the Artificial intelligence. This shows that the usage of AI could be an integral part of financial analysis in the future and could significantly improve the efficiency of the market valuation method. However, at this point in time, it should be used as a tool to facilitate analysis but not to replace it altogether.
Practical Implications: In practice, this would be able to help execute valuations significantly faster and easier than ever before, but with the necessity of the valuator to make sure the peers provided are relevant to the company being valuated.
Originality/Value: No similar study has been done regarding the implications of AI in enterprise valuation methodologies and therefore this would bring significant added value to this area of study.
Paper Type: Case study

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INTRODUCTION

The rapid development of technology reveals a trend of necessity and dependence on it. This dependence, in turn, leads to the need for adaptability and the use of these technologies to improve and build on already accepted methodologies and approaches used both professionally and personally.

One area of technology that is gradually becoming an integral part of everyone's daily life is artificial intelligence. Its effects and usefulness have been widely discussed but are currently still unclear and subject to research and comment. The purpose of this paper is to reveal whether the use of artificial intelligence could improve the efficiency of applying the market method to enterprise valuation. For the purpose of the analysis, two types of artificial intelligence are considered.

Two hypotheses are considered, which are:

1) H0 - Artificial intelligence can help make market valuations significantly easier and faster.
2) H1 - Artificial intelligence could not adequately support the application of the market valuation method.

The topic is modern and up to date, because the development of technology implies its inclusion and use in the daily professional needs of each person. This is only possible with a thorough understanding of the benefits and negatives of the respective technologies. Artificial intelligence is one of the most relevant fields of development in the field of digitalization and in modern society, and new and improved benefits related to it are constantly emerging. Because of this, the subject of this research is the effect AI has on the use of the market valuation approach, which takes the role of the object.

The main task, which has been realized in this work, consists in the implementation of the selected valuation model and the subsequent comparison of the obtained results in order to draw conclusions and inferences regarding the described hypotheses.

DIGITALIZATION IN THE FINANCIAL SECTOR

The digitalization of the financial sector is a topic addressed by a number of authors. The integration of technology into the banking and insurance sectors and its daily use by both consumers and the institutions themselves is clear evidence of the significant benefits that technology brings to the financial sphere. It is also important to mention the potential downsides of the technological boom, namely the "cyber" risks it brings with it. Their importance is also noted by the authors Aleksandrova et al. (2023) who state that terms such as "cyber security", "cyber risk", etc. are progressive entrants, across all industries, terms that are evolving at a pace no slower than technology. In terms of artificial intelligence, they maintain that it can be used to manage risks as well as enable rapid computing capabilities, gradually making this tool more common in financial institutions (Aleksandrova et al. 2023).

Implementing artificial intelligence in the financial sphere has several benefits, many of which are automation of certain tasks and facilitated analysis of markets and historical data (Bonaparte 2023). Other authors advocate the idea that artificial intelligence could help identify risks, weaknesses in processes, etc. (Kumar et al. 2019). This is further corroborated by authors Bahoo et al. (2024) who summarize several benefits of artificial intelligence in the financial domain, including: forecasting systems, early warning systems, and analysis of large data sets .

The authors described above agree around the general idea that artificial intelligence has significant benefits for the financial sphere and the functions performed in it. Some of these benefits could also be directly linked to methods of valuing companies, namely forecasting systems and analytics systems.

For the purpose of the study, an explanation of what constitutes a company's valuation is necessary. This process is extremely complex because the true value of companies is defined as "hidden and invisible" (Nenkov and Hristozov 2023). In order to determine the value of a company, it is important to understand when a company actually creates value. Theoretical frameworks on this issue are mixed. Damodaran (2002) views value as the set of a company's growth prospects, as well as its risk profile and the free cash flows available to it. On the other hand, Koller et al. (2015) view it as the difference between the cash inflows a company receives from an investment and its ability to keep its earnings constant. A third perspective on company value views it as the benefits derived from an investment, which in turn lead to an increase in capital and a corresponding increase in value (Miciuła et al. 2020). To summarize the above, the value of a company should be defined as its ability to generate income, derive benefits from its activities and its ability to manage, maintain and increase them in the future as measurement is done precisely through valuation methods. It is important to note that the extent to which the value obtained through the models approximates the actual value depends mainly on the quality and durability of the valuation process, as well as the valuation approaches and methods used (Nenkov and Hristozov 2022).

The determination of value can be done in many ways, one of which is through DCF valuation models, comparative valuation models and the like (Nenkov and Hristozov 2023). The approach chosen for

this study is the market valuation method, which is part of the comparative models. It is also considered as one of the most popular valuation methods, which is supported by the research of Bancel and Mitoo (2014). Company value under this approach is a comparison of a company's stock price with that of a selected group of similar "peer" companies (Damodaran 2006). The Corporate Finance Institute defines it as a method that reveals the value of a company using financial metrics such as market multiples "EV/EBITDA, EV/Revenue, P/E etc." comparing them to similar companies in the market (CFI team). Nenkov (2015) defines them as an approach where assets are valued based on the market price of similar assets. In international valuation standards, it is defined as a method of determining the value of an asset by comparing it to identical or comparable assets for which price information is available (IVS 2023). This method was chosen for the analysis because of its ability to reveal the usefulness of artificial intelligence in providing necessary financial information, while testing its ability to provide up-to-date and accurate data that would be useful to any valuator who put this digital tool into practice.

The use of artificial intelligence in the process of assessing the value of companies could increase the efficiency of execution and could save significant time. An example of this is a study done by several researchers at Harvard University who use this type of machine learning software to determine the potential success of startups. They came to the conclusion that thanks to these software, they were able to predict with a reasonable degree of confidence the value and potential success of these startups through a set of variables (Ang et. al. 2022). This suggests that these and similar AI-based algorithms should be potentially useful in other aspects of financial analysis. Something similar can be seen in a study by Hoang and Weigratz (2023), who used a machine learning algorithm to forecast property market prices in Germany. The results of their study showed that the models that used machine learning algorithms to predict prices came significantly closer to the actual value of properties than using the standard linear regression model.

Taking these examples into account, it is safe to assume that considering machine learning models in terms of improving the efficiency of financial valuations is a topic that requires consideration. For this purpose, two artificial intelligence models are used and analyzed:

- A language model that provides information in the form of chat (OpenAI 2023)
- A platform integrating machine learning algorithms and data analytics to deliver market intelligence (Comparables.ai 2023).

RESEARCH METHODOLOGY

The increasing use of artificial intelligence and its corresponding application in various aspects of both finance in general and valuation models, as described in the previous section, raises the need for a practical analysis of its effects. To this end, a detailed methodology of the study and the constraints placed on it are constructed and described in order to maximize objective results. The results are then evaluated based on a number of measurable criteria set in place.

For the purpose of the study, a public company was randomly selected, which is an active enterprise and the shares of which are actively traded on the relevant stock exchange for the company. The selection of the company was made on the basis of a lottery principle, out of 50 listed companies 1 was drawn to be the subject of the study. The only restriction regarding the industry in which the company operates is that credit institutions are avoided due to their specificity of activity and the specifics in their financial information. An additional constraint placed is for the company to not be Bulgarian since, based on the research of Nenkov (2023), the confidence of Bulgarian experts in the chosen method is not particularly high. He notes that the reason for this is the small stock market in Bulgaria, which limits both the number of analogues and the reliability of their multiples. The chosen company is the Hungarian pharmaceutical company - Richter Gedeon Nyrt. Using publicly available information, three valuations of the selected company were performed. The Market Valuation Method was applied, and the choice of analogues was limited to 5 for each of the valuations. The financial multiples used are limited to 3, namely the Price/Earnings (P/E) ratio, the Enterprise Value/EBITDA (EV/EBITDA) and the Enterprise Value/Revenue (EV/Revenue). They were chosen because they most clearly represent a company's ability to generate earnings and present an objective picture of its condition, while also being among the most widely used valuation multiples under the chosen methodology, which is supported by the empirical research of Bancel and Mitoo (2014). This is further supported by the research of Fernandez (2023), who identifies them as the most relevant when valuing companies in almost any sector of the economy. The date as of which the valuations were carried out is 31.12.2023, as this is the last completed fiscal year and the traceability of the data is significantly more correct and facilitated. The valuation method has been applied as follows:

1) A market valuation method performed using specialized artificial intelligence that provides market analogs based on a given company and predefined filters. This software also provides the multiples of these market analogues and their financial information.

2) A market valuation method carried out using a chat bot type artificial intelligence. A set of parameters were created, which include:

a. Which is the company being valuated
b. What analogues are sought in concreteness
c. A requirement to provide the maximum information necessary to implement the method.

For this purpose, the following question to the software is built: "I will perform a valuation using the market valuation method. The company I will be valuating is Richter Gedeon Nyrt. For this purpose, I need market analogues that are as close as possible financially to the company I have chosen. These analogues must have similar: financial ratios, scale of operations and possibly be in similar areas of activity. Please provide me with up to 5 market analogues that have the above characteristics. I would also like the maximum amount of publicly available financial information to be provided for each of these peers (Total Revenue, EBITDA, Net Profit, Cash, Debt, Enterprise value, Market capitalization, Shares outstanding) as well as their market multiples P/E, EV/EBITDA, EV/Revenue. Let the data be limited to 31.12.2023. In tabular form."

3) A market-based valuation method performed by applying an already established valuation methodology where the valuator chooses a list of analogues that are as close as possible in financial terms to the selected company, including financial data, market multiples and other information necessary for the application of the model.

The measurement of potential efficiency improvement is based on five main criteria. These criteria are as follows:

- Speed of execution - this criterion aims to show to what extent the use of the particular AI would save time for the application of the Market valuation method.
- Timeliness of the information - this criterion aims to clarify whether the companies that the AI offers as analogues are actually in the given state and to what extent there is a difference in their market multiples, comparing the data provided by the AI against the actual market state of the company.
- Adequacy of analogues - this criterion aims to check to what extent the companies provided by the AI can be considered as analogues. This is verified by a test of consistency of coefficients, consistency of business area and consistency in scale.
- Adequacy of the obtained results - a criterion indicating to what extent the results obtained by the 3 methods are as close as possible to the real market value of the selected company. This is done on the basis of a comparison of the results of the three executed point valuations with the market value of the shares of the selected company. For the purpose of the study, it is assumed that the market value at the time of valuation of the company coincides with its real value.
- Financial resources required - this criterion aims to verify the financial resources that would be required by a company or an evaluator to use the relevant AI.

Timekeeping is done with a stopwatch and starts from the moment the selected web browser is opened for use. In order to maximize objectivity, all data will be applied to the same template in MS Excel, which is open and ready to integrate input data before the timer starts. The data for the selected company (Richter Gedeon Nyrt.) is pre-integrated with data from the annual consolidated financial statements. Checks on the timeliness and adequacy of the information and results are not subject to timing. Due to the involvement of companies from different countries, the amounts presented are in US dollars for the purpose of objectivity.

RESULTS OF THE STUDY

Valuation using specialized artificial intelligence.

The time required to load and start the software is 46 seconds. The filters that are set up in the AI include company selection and keywords to focus the search on peer companies. When a valued company is selected, the software recommends keywords to use to find analogs. For the purpose of the valuation, 2 keywords tied to the selected company were used: 'pharmaceuticals' and 'pharmacy'. The time required to set up the filters and load the companies is 1 minute and 26 seconds. The software provides at least 30 options for analogue companies in its free version and at least 5000 in its paid version. Companies are selected at the discretion of the evaluator. The 5 selected analogue companies are the first 5 proposed, namely Roche Holding AG; Merck & Co., Inc; GSK plc; Johnson and Johnson; Teva Pharmaceutical Industries Limited (Appendix 1). A limitation of the selected software is that the free version does not provide the ability to access the financial information of the analogue companies, forcing the collection of information from other sources. The time taken to retrieve the required data from the respective exchanges is 23 min and 36 sec (Yahoo finance 2024). The market multiples are sourced directly from the stock exchanges and no further calculation is required for them. Based on the market multiples and the financial data of the selected company, intermediate market prices are derived for each of the multiples, which are subsequently weighted

at the discretion of the valuator. The median of the market multiples of the analogue companies listed by the specialized software is used for the valuation. The medians, the resulting intermediate prices and the weights to the final valuation by the respective market multiples are presented in Table 1:

Table 1. Results from first methodology

	P/E	EV/EBITDA	EV/Revenue
Median of each coefficient	14.10	9.80	4.39
Interim price for each coefficient	32.72	33.71	54.22
Weight of each multiple	40%	40%	20%
Weighted price for the chosen method		37.41	

Source: Personal calculations

Weighting the resulting interim market prices forms a final market valuation per share of the selected company of $37.41. The final time to complete the valuation was 25 minutes and 48 seconds (Appendix 2).

Valuation using a "chat bot" language model AI

The time required to load and start the model is 1 minute and 15 seconds. The command input to the AI is pre-prepared for objectivity and to remove the "writing speed" factor. Upon entering the pre-described command into the selected language model, 5 analogues of the selected company are proposed with the requested financial data information and market multipliers. The list of companies obtained includes Teva Pharmaceutical Industries Limited; Hikma Pharmaceuticals PLC; Sanofi S.A.; Bayer AG; Novartis AG (Appendix 2). The time taken for the artificial intelligence to provide the information, from the time the query is sent until the full dataset is loaded, is 25 seconds. The data generation was done as it was set in the prompt, in tabular form. The software allows downloading the table in ".csv" format. This greatly facilitates the transfer of the data from the software to the prepared template. The table generated by the artificial intelligence adjusts the columns to match the specified required information in the order it is requested. Therefore, when the condition is set, the evaluator can set the columns that the language model should generate for him. The total time required to transfer the data from the generated table to the already prepared template is 12 minutes and 9 seconds. The financial coefficients provided by the AI were used and no further calculation was performed for them. Since the template has already set formulas, no further calculation or setting of additional formulas is needed. Based on the market multiples and the financial data of the selected company, market prices are derived for each of the multiples, which are subsequently weighted at the discretion of the valuator. The median of the market multiples of the analogue companies listed by the language model is used for the valuation. The medians, the resulting intermediate prices and the weights to the final valuation for the respective market multiples are presented in Table 2 as follows:

Table 2. Results from second methodology

	P/E	EV/EBITDA	EV/Revenue
Median of each coefficient	11.60	8.10	2.33
Interim price for each coefficient	26.92	28.02	29.21
Weight of each multiple	40%	40%	20%
Weighted price for the chosen method		27.82	

Source: Personal calculations

Weighting the resulting interim market prices forms a final market valuation per share of the selected company of $27.82. The final time to complete the valuation was 13 minutes and 49 seconds (Appendix 3).

Valuation using a standardized methodology, without the use of AI

The standardized methodology includes an analysis of potential peer companies based on their financial ratios. Market analogues are selected by reviewing companies operating in the same field as the selected one (pharmaceutical industry), without limitation of the country of operation and selecting the most relevant ones. Return on equity (ROE) and net operating margin (NOM) are the main weights in the selection. The selected peers are Innoviva, Inc; Faes Farma, S.A.; Virbac SA; Bavarian Nordic A/S; Ipsen S.A. The time required to analyze and select the analogue companies was 48 min and 35 sec. For the purpose of the valuation, the financial data of the companies (Yahoo finance 2024; GFO of the analogues) were procured and their data were plotted in the valuation template. Time required to collect and insert the financial

information is 22 min and 21 sec. Their market multiples were calculated based on the imported data. The template automatically calculates them, and no additional time is needed. Based on the calculated market multiples and the financial data of the selected company, interim market prices are derived for each of the multiples, which are subsequently weighted at the discretion of the valuator. The median of the market multiples of the selected peer companies is used for the valuation. The medians, the resulting interim prices and the weights for the final valuation by the respective market multiples are presented in Table 3 as follows:

Table 3. Results from third methodology

	P/E	**EV/EBITDA**	**EV/Revenue**
Median of each coefficient	14.05	6.25	2.12
Interim price for each coefficient	32.60	21.83	26.62
Weight of each multiple	40%	40%	20%
Weighted price for the chosen method		27.10	

Source: Personal calculations

Weighting the resulting interim market prices forms a final market valuation per share of the selected company of $27.1. Final time to complete the valuation was 70 minutes and 56 seconds (Appendix 4).

Measurement of potential improvements in efficiency

After reviewing the three assessments, each was evaluated using the criteria described above.

In terms of speed of execution, the second approach, using a language model, was the clear winner. The speed of data generation and the ability to summarize the data in a table significantly shortened the time required for valuation. The first approach is almost twice as slow, but it is important to note that its main delay comes from the need for the software to be paid for in order to function in its fullness. The third approach is the slowest in terms of implementation time due to the need to do a thorough analysis of the market and all similar companies from which to sift a set of peers that have a certain level of comparability.

In terms of the timeliness of the information, the first approach cannot be evaluated since the information acquired is from the exchanges and not from the software itself. The linguistic model, on the other hand, provided coefficients that, although extremely close to those of the evaluated company, did not match the current state of the analogues. For example, Hikma Pharmaceuticals PLC, according to the artificial intelligence, has a P/E ratio=14.3, while a reference to many trading platforms as well as the company's own reports, this ratio is equal to 26.47. Similar variances are found in other peer companies, which calls into question the timeliness and truthfulness of the financial data provided by the model.

In terms of the adequacy of analogues, the first approach provides peers from the same industry as the company being valued, but after reviewing for comparability, each of the companies has a significantly larger scale of operations as well as higher returns. This, in turn, distorts the result under this approach. The second approach provides both peers that are in the same industry as the valued company and significantly more similar in financial terms of scale to the previous approach. Again, companies of larger scale are present, but have comparable rates of return as well as margins, meaning that the companies can be considered market analogues. The companies selected in the third approach are both comparable in scale, industry and financial ratios, but the analysis and selection in turn took almost five times longer (Appendix 5).

The adequacy of the results obtained was tested based on a comparison of the price per share under each of the approaches compared to the market price per share of the selected company as of 31.12.2023 of $25.2. The first approach shows the largest deviation, which is largely due to the incomparability of the peers and their multiples. The second approach shows an extremely close result to the market price per share, but since the multipliers are distorted and not real, it cannot be fully accepted as correct. The third approach shows an equally close price as a result, but with the actual coefficients and multipliers of the peers, it is the only approach that passes this test.

The financial resources required to use the software are equally important. The first approach is the most limited and requires the most significant resources to use, but since the paid version has not been tested, its benefits are unclear. The free version shows benefits in terms of systemizing and suggesting potential options that would facilitate the analysis when applying the standard approach. The second method, on the other hand, does not require financial resources to provide the information, but does not provide up-to-date and truthful information, so its benefits are also limited to systematizing and summarizing potential options for analogues, which would save time in applying the 3rd approach. Resources required for the 3rd approach are not considered.

CONCLUSION

This research is based on the ever-increasing consumption of machine learning-based software and platforms, namely artificial intelligence. Its aim is to reveal whether this software can improve the efficiency of one of the well-established valuation methods, the Market Approach.

A thorough review of the analysis reveals an interesting picture. Artificial Intelligence speeds up the execution of the valuation with the chosen method significantly. The data is available within seconds, and anyone could have access to it. The set filters and requirements set by the user further ensure specificity and systematicity in the information obtained. Platforms and software that are based on these machine learning algorithms are largely free to use, albeit with limitations in some cases.

An examination of this topic also reveals negative aspects of artificial intelligence. It is very important that when a person uses these tools, they are aware of what their goal is, what they want to achieve and how they aim to achieve it. Otherwise, these tools would only further confuse their user and be a prerequisite for serious mistakes. Another negative, which is of great importance, lies in the information that these software products provide. Artificial intelligence, although an extremely fast and useful tool, is still not a sufficiently reliable source of up-to-date and correct data. This is evident in the second valuation approach, where the most important element of the valuation, namely the market multipliers, are distorted and show a favorable result, but are a lot further from the actual result.

In conclusion, the 2nd hypothesis (H1) can be rejected because artificial intelligence could significantly improve the efficiency of the market valuation method. At the same time, the first hypothesis described in this paper (H0) can be accepted, although not in its completeness, because artificial intelligence has its benefits in improving the efficiency of the process, by simultaneously reducing the required execution time and facilitating the selection process. It can provide many and systematized different potential options for market analogues needed to perform the analysis. It is important to note, however, that this type of software should not be trusted for financial data to its fullest extent. These remain the responsibility of the valuer to collect and calculate the necessary factors for the valuation. There is undoubtedly much scope for further development of the subject and research into how it can be most effectively implemented. It is safe to say that artificial intelligence could be an integral part of financial analysis in the future and could significantly improve the efficiency of the market valuation method. However, at this point in time, it should be used as a tool to facilitate analysis but not to replace it altogether.

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Peer group financial data, ratios, market capitalization. https://finance.yahoo.com/.

APPENDIX 1. INFORMATION PROVIDED BY AI MODELS

Comparables.ai – table

Table 4. Peer group data table as per Comparables.ai

Name	Website	Industry	Employees	Founded
Roche Holding AG	https://www.roche.com/	Biotechnology Research	97413	1896
GSK	https://www.gsk.com/en-gb/	Pharmaceutical Manufacturing	106892	1830
Merck & Co., Inc.			0	
Johnson and Johnson	https://www.johnsonmedsolutions.com/		5	
Teva Pharmaceutical Industries Limited	https://www.tevapharm.com/	Pharmaceutical Manufacturing	24909	1901

Source: www.comparables.ai, specialized AI

Language model – Chat GPT 4.0 – tables

Table 5. Peer group data table as per GPT

Comparable companies' financial data	Total Revenue (billion $)	EBITDA (billion $)	Net Profit (billion $)	Cash (billion $)	Debt (billion $)	Enterprise Value (billion $)	Market Capitalization (billion $)	Shares Outstanding (million)
Teva Pharmaceutical Industries Limited	14.93	3.52	0.417	2.2	23.4	34.8	19.26	1158
Hikma Pharmaceutical PLC	2.88	0.871	0.19	0.287	1.15	4.85	4.4	221
Sanofi S.A.	45.37	13.14	6.21	10.56	21.87	106.15	118.92	2516
Bayer AG	53.42	11.67	4.13	4.19	39.34	91.34	53.42	982.42
Novartis AG	52.73	16.16	11.73	13.95	21.26	227.43	227.43	2265

Source: chatgpt.com, Language model AI

Table 6. Market multipliers data table as per Chat GPT

Company	P/E	EV/EBITDA	EV/Revenue
Teva Pharmaceutical Industries Limited	10.9	9.88	2.33
Hikma Pharmaceuticals PLC	14.3	7.8	1.84
Sanofi S.A.	11.6	8.1	2.34
Bayer AG	9.8	7.8	1.71
Novartis AG	13.2	12.6	4.32

Source: chatgpt.com, Language model AI

APPENDIX 2. MARKET MULTIPLIERS FOR THE FIRST APPROACH VALUATION

Table 7. Market multipliers of the peer group for the first approach

Company	P/E	EV/EBITDA	EV/Revenue
Richter Gedeon Nyrt.	10.93	7.74	2.13
Roche Holding AG	17.47	11.99	3.68
GSK	9.83	7.61	2.47
Merck & Co., Inc.	60.57	24.54	5.10
Johnson and Johnson	10.73	7.34	15.56
Teva Pharmaceutical Industries Limited	N/A	N/A	N/A
Arithmetic Average	24.65	12.87	6.70
Median	14.10	9.80	4.39

Source: www.comparables.ai and personal calculations of multiples

Table 8. Valuation for the first approach

Richter Gedeon Nyrt.			
	P/E	EV/EBITDA	EV/Revenue
Enterprise value per multiple	5 893 000 000	6 076 000 000	9 877 500 000
Total debt	150 000 000	150 000 000	150 000 000
Cash and cash equivalents	320 000 000	320 000 000	320 000 000
Market capitalization per multiple	6 063 000 000	6 246 000 000	10 047 500 000
Total shares outstanding	185 310 000	185 310 000	185 310 000
Interim price for each coefficient	32.72	33.71	54.22
Weight of each multiple	40%	40%	20%
Weighted price per multiple	13.09	13.48	10.84
Weighted price for the chosen method		37.41	

Source: Personal calculations

APPENDIX 3. MARKET MULTIPLIERS FOR THE SECOND APPROACH VALUATION

Table 9. Market multipliers of the peer group for the second approach

Richter Gedeon Nyrt.			
Company	P/E	EV/EBITDA	EV/Revenue
Richter Gedeon Nyrt.	10.93	7.74	2.13
Teva Pharmaceutical Industries Limited	10.90	9.88	2.33
Hikma Pharmaceuticals PLC	14.30	7.80	1.84
Sanofi S.A.	11.60	8.10	2.34
Bayer AG	9.80	8.80	1.71
Novartis AG	13.20	12.60	4.32
Arithmetic Average	11.96	9.24	2.51
Median	11.60	8.10	2.33

Source: chatgpt.com and personal calculation of averages

Table 10. Valuation for the second approach

Richter Gedeon Nyrt			
	P/E	**EV/EBITDA**	**EV/Revenue**
Enterprise value per multiple	4 818 000 000	5 022 000 000	5 242 500 000
Total debt	150 000 000	150 000 000	150 000 000
Cash and cash equivalents	320 000 000	320 000 000	320 000 000
Market capitalization per multiple	4 988 000 000	5 192 000 000	5 412 500 000
Total shares outstanding	185 310 000	185 310 000	185 310 000
Interim price for each coefficient	26.92	28.02	29.21
Weight of each multiple	40%	40%	20%
Weighted price per multiple	10.77	11.21	5.84
Weighted price for the chosen method		27.82	

Source: Personal calculations

APPENDIX 4. MARKET MULTIPLIERS FOR THE THIRD APPROACH VALUATION

Table 11. Market multipliers of the peer group and valuation for the third approach

Company	**P/E**	**EV/EBITDA**	**EV/Revenue**
Richter Gedeon Nyrt.	10.93	7.74	2.13
Innoviva, Inc.	5.73	5.53	4.19
Faes Farma, S.A.	10.86	7.79	2.12
Virbac SA	17.30	6.25	1.59
Bavarian Nordic A/S	14.05	5.80	1.76
Ipsen S.A.	15.05	10.69	2.87
Arithmetic Average	12.60	7.21	2.50
Median	14.05	6.25	2.12

Source: Personal calculations

Table 12. Valuation for the third approach

Richter Gedeon Nyrt.			
	P/E	**EV/EBITDA**	**EV/Revenue**
Enterprise value per multiple	5 871 325 924	3 875 153 192	4 762 738 048
Total debt	150 000 000	150 000 000	150 000 000
Cash and cash equivalents	320 000 000	320 000 000	320 000 000
Market capitalization per multiple	6 041 325 924	4 045 153 192	4 932 738 048
Total shares outstanding	185 310 000	185 310 000	185 310 000
Interim price for each coefficient	32.60	21.83	26.62
Weight of each multiple	40%	40%	20%
Weighted price per multiple	13.04	8.73	5.32
Weighted price for the chosen method		27.1	

Source: Personal calculations

APPENDIX 5. COMPATIBILITY TESTS

Table 13. Compatibility test of the peer group for the first approach

Compatibility test				
	ROA	**Net margin**	**ROE**	**Market cap (mln. $)**
Richter Gedeon Nyrt.	14.00%	19.11%	12.00%	4 700
Roche Holding AG	12.44%	19.02%	37.86%	202 110
GSK Plc	9.31%	14.59%	38.78%	75 260
Merck & Co., Inc.	10.26%	3.76%	5.31%	276 260
Johnson and Johnson	19.50%	41.28%	49.20%	340 110
Teva Pharmaceutical Industries Limited	-1.30%	N/A	-7.60%	19 260

Source: Personal calculations

Table 14. Compatibility test of the peer group for the second approach

Compatibility test				
	ROA	**Net margin**	**ROE**	**Market cap (mln. $)**
Richter Gedeon Nyrt.	14.00%	19.11%	12.00%	4 700
Teva Pharmaceutical Industries Limited	-1.30%	N/A	-7.60%	19 260
Hikma Pharmaceutical PLC	8.46%	6.61%	8.81%	4 400
Sanofi S.A.	4.30%	11.60%	7.30%	118 920
Bayer AG	-4.04%	N/A	-8.13%	53 420
Novartis AG	8.65%	31.94%	19.83%	227 430

Source: Personal calculations

Table 15. Compatibility test of the peer group for the third approach

Compatibility test				
	ROA	**Net margin**	**ROE**	**Market cap (mln. $)**
Richter Gedeon Nyrt.	14.00%	19.11%	12.00%	4 700
Innoviva, Inc.	7.46%	33.30%	16.24%	1 030
Faes Farma, S.A.	8.46%	19.66%	14.93%	998
Virbac SA	5.45%	11.50%	10.69%	31 720
Bavarian Nordic A/S	7.85%	14.82%	10.20%	13 830
Ipsen S.A.	9.02%	19.49	17.30%	9 700

Source: Personal calculations