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Evaluation of Key Parameters Used by Financial Analysts to Value Companies in Poland

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Abstract:

Purpose: *The purpose of this article is to review the most important research on the role of financial analysts and to assess the validity of key parameters used to value companies in Poland.*
Design/Methodology/Approach: *The literature review addresses major studies conducted both globally and in Poland on the role of financial analysts and valuation errors. In addition, a study was conducted on the correctness and consistency of 42 valuations relating to 15 companies listed on the Warsaw Stock Exchange prepared by financial analysts representing three brokerage houses. The results of this research were compared with earlier studies conducted by the author and other authors on the Polish capital market at the beginning of the current century.*
Findings: *The significant deficiencies in key parameters used by financial analysts in Poland over the years include: Lack of clear indication on how the risk-free rate was determined; Subjective determination of the Beta index; No source or justification provided for the risk premium used; Inconsistencies in applying the risk-free rate, Beta coefficient, and risk premium across valuations of the same companies over short timeframes; Variability in risk-free rates and risk premiums in different valuations by the same brokerage firms simultaneously; Absence of justification for changes in parameters in subsequent valuations of the same company. Despite a notable unification of income valuation methodologies in the past 8-10 years, with reduced variations in key DCF parameters among brokerage firms, it's challenging to determine if this standardization resulted solely from improved analytical practices. It may also stem from analysts mimicking the methods of their peers to align with market benchmarks. Typically, methodological standards are set by the largest and most established brokerage houses.*
Originality/value: *This study is one of the few dedicated to assessing the determination and accuracy of key parameters used by financial analysts in DCF valuations in Poland.*

Keywords: *Financial analysts, valuation, business valuation, valuation errors.*

JEL classification: *D46, D53, D84.*

Paper Type: *Review and research article.*

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1. Introduction

One of the most important tasks of financial analysts is to make recommendations on listed companies. Often the investment decisions of many individual as well as institutional clients are based on these opinions. This is especially true in young markets, which include the Polish capital market. Recommendations should therefore fulfill a kind of educational function, being at the same time an important set of information about the fundamental situation of the company and its position in the market.

Analysts' opinion as to the attractiveness of a given company is usually based on a valuation, through which it can be determined whether the market value of a company is in line with the valuation made by analysts, or whether it is undervalued or overvalued. In Poland, financial analysts perform their valuations primarily within brokerage firms, although an increasing number of financial analysts are working for banks and investment funds and corporations.

The objective of the paper is to review the most important research on the role of financial analysts and to assess the validity of key parameters used to value companies in Poland.

1.1 Valuation as a Key Focus for Financial Analysts

Valuation theory and practice distinguish three approaches to business valuation:[i] 1) the income approach, 2) the market approach, and 3) the asset approach. Financial analysts primarily use the income approach, which best captures the sense of investment and value. The market approach is usually complementary to the income approach. The asset approach is used relatively less frequently, particularly in the valuation of various funds.

Another division distinguishes between absolute valuation and relative valuation. Such a classification can be found in the extensive research work of M. Whitehouse[ii], among others. Absolute valuation is supposed to reflect a company's fundamental value, while relative valuation also refers to current market sentiment.

Hence it is sometimes encountered to contrast valuation (absolute valuation) with price confirmation (relative valuation). Valuation versus pricing. Absolute valuation quantifies a company's financial risk using key figures collected by financial analysts, often based on specific assumptions (e.g. future cash flows, discount rates, growth rates). Commonly used models for absolute valuation include:

- Discounted cash flow (DCF): The sum of the discounted free cash flows for all fund providers (Free Cash Flow to Firm - FCFF) or owners (Free Cash Flow to Equity - FCFE), respectively.
- Residual income valuation (also known as the residual income model or residual income method) is an equity valuation method that is based on the assumption that the value of a company's stock is equal to the present value of future residual income discounted by the corresponding cost of equity.
- Discounted Dividend Model (DDM): The sum of discounted future dividends.
- Sum-of-the-Parts (SotP): The sum of the individual parts of the company.
- Industry ratios: some industries use specific ratios, such as solvency in insurance.

Generally, the absence of any absolute valuation is viewed as partial incomprehensiveness.

Relative valuation is an approach that compares a company to a peer group with similar products or market presence. Typical measures include:

- P/E Ratio: Share price divided by earnings per share; key for evaluating shares.
- EV/EBITDA: Compares enterprise value with earnings before interest, taxes, depreciation, and amortization; helps assess fair market value.
- PEG Ratio: P/E ratio divided by expected earnings growth; indicates whether a stock is undervalued (PEG < 1) or overvalued (PEG > 1).

The P/E ratio is particularly important for standardized market comparisons of share valuation. This distinction between absolute and relative valuation methods underscores different approaches to assessing a company's financial health and market position, offering insights for investors. This article is limited to absolute valuation, including primarily the DCF (discounted cash flow) method commonly used by financial analysts.

1.2 The Role of Financial Analysts

The role of a financial analyst involves evaluating financial data, analyzing current events and market trends, examining financial statements, and creating models to predict future performance. Analysts may focus on macroeconomic trends or specialize in specific sectors. These roles are data-driven and require strong

mathematical and analytical skills. Financial analysts can work for a variety of organizations, including investment banks, insurance companies, mutual funds, hedge funds, pension funds, securities and investment firms, private equity, venture capital, and government agencies[iii].

Financial analysts' text products impact all stakeholders of the financial community and the financial markets. The availability of these texts has changed over time. Whereas three decades ago, studies for retail investors were often freely available in the bank counter area, nowadays, the majority of financial analysts' reports, studies, and recommendations is only accessible to investors who are either customers of a bank or pay for these text products.

The "Markets in Financial Instruments Directive II" (MiFID II), in force as from the beginning of 2018, has further regulated the access: financial institutions must raise fees for all financial analysts' text products. These fees can be included in service packages for investors (indirect charging), or fees can be raised if stakeholders are not clients of the financial institution (direct charging)[iv].

Since the beginning of modern capital markets, two conflicting views have clashed over the ability to predict future stock prices, and thus the role of financial analysts. Representatives of the first view believe that predicting future prices, and therefore making accurate recommendations, is not possible. According to many researchers representing this view, the effectiveness of stock recommendations issued by professional analysts is close to that of a strategy based on random stock selection.

The claim that in the long term stock market recommendations give no investment advantage is not new. As early as the 1930s, American Alfred Cowles[v] proved that following analysts' recommendations, statistically speaking, leads to the same results as buying and selling stocks at random. Yes - if we hit a period of a stock market bull market, the value of our portfolio is also likely to increase. But if we happen to invest in a bear market, losses are inevitable.

According to the assumptions of the efficient market hypothesis: if some information is widely known, it will almost certainly already be included in the stock market valuation. The authors, who belong to the skeptics' group, believe that it is unlikely that stock market analysts will see something that the market has not yet bumped into, and thus be able to forecast the future more accurately than others.

They contend that the second scenario, in which an analyst omits some important detail, so that the predictability of his recommendation decreases, is rather more realistic. Skeptics conclude that treating stock market recommendations as a signpost for investing is a rather poor idea. They admit that there are experts whose predictions come true more often than others. But this does not change the overall conclusions in terms of the usefulness of stock market recommendations.

To accept as valid the first view would mean the uselessness of the financial analyst profession. In fact, the profession is growing spectacularly and is one of the quite prestigious ones in the financial community. This means that the prevailing view is that analysts can identify such information that the market has not taken into account in the valuation, the inclusion of which would lead to a different valuation.

Confronting their valuations with current market (stock market) valuations, analysts make recommendations: neutral, positive (buy) or negative (sell). Hence, the work of financial analysts is important giving potential benefits to investors in their decisions on the stock market. Therefore, research into how they work, the valuation methods they use, the assumptions they make, their objectivity and independence, etc., is important.

2. Literature Review

Issues concerning the work of financial analysts are the subject of numerous studies. Ramnath, Rock, and Shane developed a taxonomy of research examining the role of financial analysts in capital markets. The authors categorize articles published since 1992, describe research questions and suggest directions for further research in seven broad areas:[vi] (1) analysts' decision processes; (2) the nature of analyst expertise and the distributions of earnings forecasts; (3) the information content of analyst research; (4) analyst and market efficiency; (5) analysts' incentives and behavioral biases; (6) the effects of the institutional and regulatory environment (including cross-country comparisons); and (7) research design issues.

K.H. Chung[vii] examined the role of financial analysts as a marketing aid to brokerage firms. His research suggests that investors prefer to hold stocks of high-quality companies and that financial analysts help the marketing efforts of brokerage companies by focusing their analysis on such stocks.

Liu and Song[viii] proved that financial analysts as a whole were too optimistic about the Internet stocks before the market crash in April 2000. The rationality tests also suggest their earnings forecasts before the crash were less than rational. Authors further documented that financial analysts whose employer was a lead underwriter for the Internet company (affiliated analysts) were actually more negative in their quarterly earnings forecasts relative to those of non-affiliated analysts. Liu and Song interpret the latter evidence as supporting a conflict of interest hypothesis that affiliated analysts have incentive to accommodate managers' motive to underreport the earnings in order to have actual earnings "beat" the market expectations.

Demirakos, Strong and Walker[ix] adopts a structured positive approach to explaining financial analysts' valuation practices by examining the valuation methodologies contained in 104 analyst reports from international investment banks for 26 large UK-listed companies from the beverage, electronics and pharmaceutical sectors. The

authors provide a descriptive analysis of the use of alternative valuation models, focusing on the attributes relevant to the values that analysts seek to forecast, and the methodologies used by analysts to transform forecasts into estimates of company value.

They postulate and test a number of hypotheses relating to how analysts' valuation practices differ systematically across industries, and conclude that: (1) the use of comparative valuation is higher in the beverage sector than in the electronics or pharmaceutical sectors; (2) analysts typically choose the P/E model or the explicit multi-period DCF valuation model as the dominant valuation model; (3) no analyst uses price-to-cash flow as the dominant valuation model; and (4) contrary to expectations, some analysts who construct explicit multi-period valuation models still adopt comparative valuation as the preferred model.

2.1 Review of Studies on Valuations and Stock Recommendations in Poland

In view of the great importance of recommendations in investment decision-making, attempts to assess the usefulness and correctness of these opinions have also begun in Poland. Such attempts were made, among others, by Krzyżanowski W., Zbiejcik M., Szymański A.[x] and Napiórkowski S.[xi] According to the first study, as many as 70% of the nearly 300 recommendations were inaccurate, which means that the probability of a random price hit (50% out of 50%) is much higher than the average efficiency of brokerage firms.

However, more than 22 years have passed since this research was conducted. Interesting results were also obtained in Napiórkowski's studies. In general, they confirmed the low accuracy of recommendations and showed numerous methodological inconsistencies in the valuations conducted by brokerage firms.

Bolibok P.[xii] researched how the market cycle influences stock recommendations for banks on the Warsaw Stock Exchange from 2000 to 2016. Using correlation and regression analyses, Bolibok evaluated each recommendation 180 days post-issuance. The study analyzed 2,801 recommendations and 347,121 stock price observations for 14 banks. Findings revealed that the market cycle impacts both the direction and effectiveness of analysts' recommendations. Generally, recommendations helped stabilize bank share prices, counteracting extreme market sentiment. Target price accuracy improved in bull markets but decreased during downturns.

In Zarzecki D. and Matecki T. 2006 study[xiii], 81 valuations published online from eight brokerages were analyzed. The study was designed to assess the methodology and accuracy of valuations produced by analysts for stock market recommendations. Among the recommendations analyzed, the value of the market risk premium was not provided for ten of them. Considering the others, the average value of the premium stood at 4.8%, and is not significantly different from studies in mature

markets. Almost 89% of the premium levels analyzed were in the 4% to 5% range.

The exception is the market premium granted to companies by BOŚ brokerage office (the average was 2%). The highest risk premium of 6% was attributed to the Świecie (currently Mondi – packaging manufacturer) and was issued by DM Millennium. Analyzing the level of the market premium, it can be concluded that the vast majority of brokerage firms applied premiums that did not deviate from generally accepted values. Unfortunately, none of the examined recommendations provided justification for the adopted values.

When analyzing the impact of residual value on the total value of a company's equity, recommendations were divided into two groups. The first included valuations in which the period of detailed forecast was less than ten years (26 recommendations, an average of 6 years). In contrast, the second group was formed by recommendations in which the period of detailed forecast was ten years or more (45 valuations, average 10 years).

For all the valuations analyzed (71 companies), the average period of detailed forecast was 8.6 years, and on average 58% of the company's value was attributed to the residual value. It would seem that the longer the period of detailed forecasting, the lower the impact of residual value on the outcome of the company's valuation should be. Meanwhile, in the first group of recommendations, the impact of the residual value on the valuation result is 58%, while in the second group it is 59%. An explanation for this situation may be the level of the company's growth rate. For the first group of recommendations, this rate was 2.6%, while among those with a forecast period of more than 10 years it was only 2.0%.

Analyzing the risk-free rate, it was noted that the authors of valuations very rarely specified how it was determined. Only in the case of 12 companies (less than 15%) the source of its origin was specified. However, even in this group there are large discrepancies. In the valuations of 4 companies, the risk-free rate was defined as the inflation rate, which is not supported by any theory.

Three recommendations were compared to the yield on 5-year fixed-rate bonds and to 52-week Treasury bills and the zero-coupon rate, two recommendations each, respectively. One recommendation used the "market curve" to determine the risk-free rate. The lack of an indication of the source of the risk-free rate may raise serious questions. This is especially true if one compares the risk-free rate in valuations made by the same brokerage over a short period of time.

In a subsequent study, Zarzecki D. and Matecki T.[xiv] showed that for valuations made during the same period (identical or similar valuation date), the risk-free rate applied by each brokerage was not the same. What's more, in the case of one brokerage, analysts changed the risk-free rate as many as four times in just three days, with the largest difference between the two being 0.5%. It's to note that these

changes occurred without any market justification, suggesting they might have been driven by factors other than fundamental market data. This could mean that the various valuations were made by different teams of analysts using different ways of determining the risk-free rate. This create an undesirable situation where the valuation results and recommendations could vary based on which team within the same institution conducted the analysis.

Such discrepancies can undermine the credibility and reliability of the valuations, leading to potential conflicts of interest and inconsistencies in decision-making. A second explanation for this situation could be inadequate supervision of the valuations performed, which might lead to inconsistencies and errors. A third possibility is the deliberate manipulation of valuation parameters or assumptions, potentially skewing results for specific agendas or interests. Both explanations raise concerns about the integrity and reliability of financial analyses.

Głębocki M., Grudziński M., Kundera M., Sylwestrzak M.[xv] examined the recommendations of brokerage firms in Poland. The authors conducted an analysis of brokerage houses' recommendations issued between January 1 and September 30, 2010. Of the 57 brokerage houses operating on the Polish market at that time, slightly less than half prepared recommendations.

The subject of the study was only those recommendations which took the form of a company valuation report. Among the 224 recommendations surveyed, for 65.6% of all valuations the detailed forecast period was 10 years. Five-year forecasts were used in 6 percent of valuations, while six-year and nine-year forecasts were used in 5 percent, respectively. Interpretation and discussion of valuation results were made in 183 studies, accounting for almost 82 percent of all valuations. The remaining reports did not include a discussion of the results.

The most common deficiencies shown in this study in the application of the discounted cash flow method appeared to be a lack of justification of the discount rates used and a lack of critical interpretation of the results of the analysis. The frequent absence of complete discount rate assumptions probably indicated that the cost of capital was determined on a highly arbitrary basis or on unknown grounds. Many of the reports examined showed a lack of projected balance sheets and income statements, as well as basic valuation assumptions.

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Analyzing the cited research results, it can be concluded that the vast majority of the recommendations made turned out to be wrong, and investors who trusted them may

have suffered losses. Trying to answer the question of why this happened, it is necessary to find the source of these irregularities.

According to M. Hamrol and G. Mikołajewicz, errors can be found already in the assumptions made at the initial stage of the analysis of companies. They negate the statement that fundamental analysis allows you to answer the question of what to buy or sell within the validity period of the recommendation, i.e. within six months of its issuance. This period does not correspond to the horizon of fundamental analysis, which should be longer than a year.

With the rapid changes in stock market price trends that occured during that period in the Polish capital market, it was pointless to follow fundamental analysis in the short term. This type of analysis, should be used by medium and long-term investors who are not concerned about the temporary decline in stock prices. In addition, fundamental analysis only indicates the direction and magnitude of a stock price movement, but says nothing about when it will begin and end. The views presented by these authors were considered quite controversial in the community, arousing an interesting polemic at one of the conferences on finance held in Poland.

In another study of mistakes made by financial analysts in Poland, Mielcarz P. and Osiichuk D.[xvi] point to the need for consistency in reinvestment rate assumptions. In companies reaching maturity, assumed reinvestment rates should gradually approach the averages observed in the sector, unless the company's fundamentals suggest the need for a different assumption.

The authors showed that in 31 of the 100 recommendations randomly selected and studied, a reinvestment rate equal to depreciation was assumed in the residual period. In 4 recommendations, the investment rate contributed zero. The authors pointed out conceptual errors made by financial analysts in their valuations, which can disqualify estimated residual values in DCF valuation models.

According to a study conducted by Włodarczyk K.,[xvii] the information content associated with the valuation of a company using the DCF model is poor. The average score for this criterion was less than 30%. To a lesser extent, it concerns: information on the macroeconomic environment, the company's plans, the assumptions used to estimate free cash flow or the publication of financial statements of the company being valued.

To a greater extent it concerns: the assumptions of the valuation itself (the DCF model parameters used), the use of model parameter values of unknown origin - usually without explanation. Any analysts' biases applied in practice result in the fact that the valuation of a company by the DCF model in recommendations is not tailored to the company being valued, but is, to a great extent, a universal valuation template with some standard parameters.

The information content of recommendations has been increasing over the years studied - the average score in 2005 was 25%, while in 2012 it was 41%. The most common deficiencies in the valuation process included the use of recent rather than normalized cash flow to estimate residual value, illogical choice of parameters in the discount rate and calculation errors in the DCF model. In addition, it was shown that brokerages publishing the most recommendations generated recommendations of lower quality than institutions producing fewer recommendations.

3. Research Methodology

To current state of company valuation practices in the Polish capital market using the DCF method, the author conducted a detailed analysis of 42 valuations of 15 companies listed on the Warsaw Stock Exchange, prepared by financial analysts from three brokerage houses. Most valuations were conducted in 2024 (28), with 13 from 2023 and one from 2022.

The analysis focused on key parameters, including risk-free rate, risk premium, Beta coefficient, cost of equity, and WACC. Additionally, it evaluated whether the reports provided a clear description and justification of the methodology and parameters used. For comparative purposes, 6 valuations of 3 companies made by 4 different brokerage houses operating in Poland two decades earlier were also analyzed.

4. Research Results and Discussion

Looking at the early 2000s, there were notable and significant differences among Polish financial analysts regarding key parameters used in the Discounted Cash Flow (DCF) method.

These variations highlight inconsistencies in valuation practices, which could affect the accuracy and reliability of financial analyses in that period. This was confirmed by virtually all of the studies cited in the previous section.

A good illustration of the differences in the level of valuation parameters adopted is the data summarized in Table 1. It includes a comparison of 6 valuations carried out two decades ago concerning three companies - each company was valued by two different brokerage firms on a similar date.

The comparison shows that when valuing the same company, the brokerages differed in their assessment of perceived risk (different Beta ratios), growth rates g and risk-free rate. There were also differences in the length of the forecast period, although these were not significant.

The smallest differences concern the level of the risk premium: in the case of Polfa Kutno, both brokerages applied an identical premium, while for the other two

companies the difference between the premium applied by the CDM brokerage and the other two valuations prepared by other brokerages was only 0.5%.

Table 1. *Differences in valuation of three companies from the Warsaw Stock Exchange*

Company	Polfa Kutno		Świecie		Ciech	
Brokerage house	DI BRE	CDM	Millennium	CDM	BDM	CDM
Date of recommendation	03.09.2003	04.09.2003	19.01.2005	09.01.2005	06.01.2005	09.01.2005
Beta	1,0	0,95	1,0	0,86	0,9	0,86
Forecast period (years)	7	10	10	11	10	11
Growth rate g	3%	1,5%	2%	0	0,5%	0
Risk premium	5%	5%	5%	4,5%	5%	4,5%
WACC	10,1%	9,3%	10,8%	11,2%	10,5%	11,2%
Risk-free rate	5,5%	4,9%	6,5%	7,3%	6,6%	7,3%

Source: *Author's research based on data from brokerage houses.*

In order to assess the current state of company valuation practice in the Polish capital market using the DCF method, the author analyzed the accuracy and consistency of 42 valuations of 15 companies listed on the Warsaw Stock Exchange prepared by financial analysts representing three brokerage houses. Most of the appraisals (28 of 42) were made in 2024, 13 in 2023 and 1 in 2022.

The following tables summarize the key parameters used for the valuation of companies listed on the WSE. Table 2 presents 21 valuations of seven companies by BDM SA Brokerage House, showing consistency in the key parameters used for DCF valuations.

The Beta index remains steady across valuations, except for a temporary decrease from 0.9 to 0.8 for Synthaverse. The risk-free rate is based on the yield of 10-year Treasury bonds from the Polish Ministry of Finance, with minor variations reflecting real changes. The market risk premium is consistently set at 6.5%. A higher risk premium was applied to Synthaverse and Biomaxima through an additional specific risk premium.

However, the rationale for these additional points was not adequately explained. This lack of justification is significant, as it impacts the cost of equity, WACC, implied enterprise value, and share prices for these companies.

Table 2. *Risk free rate, risk-premium, beta, cost of equity and WACC in valuations prepared by BDM SA Brokerage House*

Company	Date of recommendation	Risk-free rate	Risk premium	Beta	Cost of equity	WACC
1. Synthaverse	6.11.2024	5,7%	8,0%	0,8	12,1%	*10,9%*
2. Synthaverse	12.07.2024	5,7%	8,0%	0,8	12,1%	*11,0%*
3. Synthaverse	10.05.2024	5,6%	8,0%	0,8	12,0%	*11,0%*
4. Synthaverse	13.09.2023	5,6%	6,5%	0,9	11,5%	*10,8%*
5. Biomaxima	6.11.2024	5,6%	9,5%	0,9	14,2%	*12,4%*
6. Biomaxima	12.07.2024	5,7%	9,5%	0,9	14,3%	*12,5%*
7. Biomaxima	5.06.2024	5,6%	9,5%	0,9	14,2%	*12,4%*
8. Enter	29.10.2024	5,8%	6,5%	1,2	15,1%	*8,9%*
9. Enter	10.06.2024	5,7%	6,5%	1,2	15,3%	*8,9%*
10. Enter	29.08.2024	5,5%	6,5%	1,2	14,8%	*8,3%*
11. Wirtualna	21.10.2024	5,5%	6,5%	1,3	14,0%	*12,3%*
12. Wirtualna	4.01.2024	5,3%	6,5%	1,3	13,5%	*12,2%*
13. Wirtualna	23.08.2023	5,6%	6,5%	1,3	13,8%	*12,4%*
14. Cyfrpolsat	16.10.2024	5,5%	6,5%	1,9	*17,5%*	*10,3%*
15. Cyfrpolsat	22.07.2024	5,6%	6,5%	1,9	*18,0%*	*10,4%*
16. Cyfrpolsat	8.05.2024	5,6%	6,5%	2,0	*18,8%*	*10,3%*
17. 11bit	24.06.2024	5,8%	6,5%	1,2	13,6%	13,5%
18. 11bit	23.01.2024	5,2%	6,5%	1,2	13,0%	12,9%
19. 11bit	14.07.2023	5,5%	6,5%	1,2	13,3%	13,1%
20. TSGames	15.05.2024	5,7%	6,5%	1,2	13,5%	13,5%
21. TSGames	23.11.2023	5,5%	6,5%	1,2	13,3%	13,3%

Source: *Author's research based on Stockwatch (https://www.stockwatch.pl/rekomendacje/dm-bdm-sa.aspx). Italics indicate cases where the model assumes that the cost of capital will vary over time.*

Table 3 highlights key parameters from 10 valuations by PKO BP Brokerage House for three companies. The Beta index remained consistent and stable, with minor

fluctuations of 0.1 for Oponeo and MLPGroup. The risk-free rate was determined using the yield on 10-year Treasury bonds from the Polish Ministry of Finance, similar to the instrument used by BDM analysts. The risk premium was identical across all valuations, which is a positive aspect. Short-term differences in the cost of equity between companies were solely attributed to variations in the Beta indices.

Table 3. *Risk free rate, risk-premium, beta, cost of equity and WACC in valuations prepared by PKO BP Brokerage House*

Company	Date of recommendation	Risk-free rate	Risk premium	Beta	Cost of equity	WACC
1. Oponeo	23.08.2024	5,0%	5,5%	1,0	10,5%	*9,6%*
2. Oponeo	23.05.2024	5,0%	5,5%	0,9	10,0%	*9,1%*
3. Oponeo	23.08.2023	5,5%	5,5%	0,9	10,5%	*9,5%*
4. Oponeo	6.02.2023	6,0%	5,5%	1,0	11,5%	*10,4%*
5. MLPGroup	28.05.2024	5,0%	5,5%	1,2	11,6%	*
6. MLPGroup	8.09.2023	5,5%	5,5%	1,1	11,6%	*
7. MLPGroup	28.04.2023	5,0%	5,5%	1,1	12,1%	*
8. Pekabex	8.05.2023	6,0%	5,5%	1,5	14,3%	*13,3%*
9. Pekabex	23.02.2023	6,0%	5,5%	1,5	14,3%	*13,5%*
10. Pekabex	20.10.2022	5,5%	5,5%	1,5	13,8%	*12,8%*

Source: *Author's research based on Stockwatch (https://www.stockwatch.pl/rekomendacje/dm-pko-bp-sa.aspx). Italics indicate cases where the model assumes that the cost of capital will vary over time. * WACC was not determined, as the income valuation was based on the residual profit method.*

Table 4 shows the key parameters of 11 DCF valuations on 5 companies carried out by Pekao SA Brokerage House. In the case of DCF valuations carried out by analysts from this brokerage house, there are the most uncertainties. The Beta index in eight of the 11 valuations relating to 4 companies is equal to 1.0. In three valuations relating to one company it is equal to 1.1.

Thus, the 4 valued companies have a risk corresponding to the average risk in the market, and one has a risk 10% higher than the average market risk. On the positive side, the risk index of the same company is maintained at the same level in successive valuations, while some doubts may be raised by the level of assumed risk identical to the market in as many as four of the analyzed companies. The risk-free rate is the yield on 10-year Treasury bonds, although this was not explicitly stated in the reports.

The risk premium for the four companies and their eight valuations is 6.0%. It is unclear why the 5.8% was assumed for Stalprofi. Interestingly, this company's valuations only subtracted 0.4% from this rate (5.8%) as an ESG discount of -0.4%, resulting in a final risk premium of 5.4%. The valuations provide the results of an ESG discount calculations, but without disclosing the assumptions of the method and the calculation formulas used.

This is a relatively new issue, and as the importance of ESG increases, it is likely to be the subject of growing interest in the theory and practice of business valuation.

Table 4. *Risk free rate, risk-premium, beta, cost of equity and WACC in valuations prepared by Pekao SA Brokerage House*

Company	Date of recommendation	Risk-free rate	Risk premium	Beta	Cost of equity	WACC
1. Skarbiec	25.10.2024	5,3%*	6,0%*	1,0	11,3%	11,3%
2. ZE PAK	15.10.2024	5,3%*	6,0%*	1,0	11,3%	*9,2%*
3. Creotech	7.06.2024	5,7%*	6,0%*	1,1	12,3%	*11,5%*
4. Creotech	14.05.2024	5,6%*	6,0%*	1,1	12,2%	*11,4%*
5. Creotech	29.11.2023	5,7%*	6,0%*	1,1	12,3%	*11,3%*
6. Stalprofi**	3.06.2024	5,7%*	5,8%*	1,0	11,0%	*9,2%*
7. Stalprofi**	30.04.2024	5,7%*	5,8%*	1,0	11,0%	*9,5%*
8. Stalprofi**	8.09.2023	5,7%*	5,8%*	1,0	11,0%	*9,6%*
9. Rainbow	12.06.2024	5,7%*	6,0%*	1,0	11,7%	11,7%
10. Rainbow	10.05.2024	5,6%*	6,0%*	1,0	11,6%	11,6%
11. Rainbow	9.06.2023	6,0%*	6,0%*	1,0	12,0%	12,0%

Source: *Author's research based on Stockwatch (https://www.stockwatch.pl/rekomendacje/bm-pekao.aspx). Italics indicate cases where the model assumes that the cost of capital will vary over time. * The indicated parameters are lower in the terminal period, which means that the cost of equity is also lower in this period; ** In three Stalprofi valuations, an ESG discount of -0.4% was applied, resulting in a final risk premium of 5.4%. This adjustment reflects the incorporation of environmental, social, and governance factors into the valuation process.*

Analysts at Pekao S.A. Brokerage House employ two distinct risk-free rates and distinct risk premiums in each valuation: one for the detailed forecast period and another, termed the terminal rate/terminal risk premium, for estimating residual value. This method contrasts with the practices of BDM SA and PKO BP Brokerage Houses. In all Pekao SA valuations, terminal risk-free rates are consistently lower at 4%, and the terminal risk premiums are lower than during the detailed forecast, set at 5%. However, no explanation is provided for choosing these specific rates and premiums.

5. Conclusions and Final Remarks

The following conclusions can be drawn from the literature review, previous research on valuations made by financial analysts in Poland and the author's own research conducted in 2024:

1. Most participants in the capital market consider valuations by financial analysts as a useful guide to investment decisions; the level of confidence in these valuations varies by market (country), investor category, sector,

brokerage firm; the level of confidence varies over time and may depend on the state of the market;

2. The establishment of the Warsaw Stock Exchange in 1991 marked the beginning of a new era in the development of the capital market in Poland; valuations prepared by brokerage houses in the period up to about 2016 were subject to many errors and shortcomings, although with the passage of time one could see gradual progress and improvement in valuation methodology;
3. Among the most important shortcomings in the key parameters used by financial analysts in Poland over the years were: lack of indication of the way of determining the risk-free rate (i.e., the financial instrument whose yield should be used); subjective (arbitrary) determination of the Beta coefficient; lack of indication of the source and justification for the risk premium used; inconsistencies in the use of the risk-free rate, Beta ratio and risk premium by the same brokerage firms in valuations of the same companies over a short period of time; use of different risk-free rates and risk premiums in different valuations by the same brokerage firms over the same period of time; lack of justification for changes in parameters made in subsequent valuations of the same company by the same brokerage firm.;
4. In past 8-10 years, there has been a notable unification of income valuation methodologies among brokerage firms in Poland. The variations in key parameters used in DCF valuations across different brokerage firms have significantly decreased compared to earlier practices, reflecting a trend towards standardization in the valuation process;
5. It is difficult to unequivocally confirm that the aforementioned unification (standardization) of valuation methodologies is solely the result of financial analysts improving their craft, rather than imitating what other financial analysts are doing;
6. Some financial analysts are likely to look at the valuation method (assumptions made, parameters used, etc.) applied by others and try to adjust their valuations so that they are not significantly different from market benchmarks. Methodological templates are usually set by the largest or most established brokerages;
7. The three Polish brokerages whose valuations were analyzed in 2024 used very similar methodologies with respect to setting key parameters for DCF valuations, but one of them (Pekao SA Brokerage House) employs two distinct risk-free rates and two distinct risk premiums in each valuation: one for the detailed forecast period and another, termed the terminal risk-free rate/terminal risk premium, for estimating residual value;
8. A new discount, the so-called ESG discount, has appeared in the valuations of Polish brokerage houses in recent years; unfortunately, no detailed methodology for calculating this discount was provided in the valuations analyzed;
9. In none of the valuations analyzed in 2024 did the analysts indicate how to determine the Beta coefficient level; the same problem was also signaled by

various authors conducting research in earlier years.

An broader observation is that analysts tend to rely heavily on simple P/E multiples rather than employing DCF or earnings-based valuation models to support their stock recommendations. Additionally, they frequently utilize other market value ratios and then typically determine a weighted average of the estimated values in a subjective manner. This approach may reflect a preference for methods that are easier to communicate and understand, although it can introduce biases and reduce the robustness of their analyses.

The use of AI by financial analysts for valuation and determining investment strategies seems inevitable. The benefits and advantages over the traditional way analysts work are also confirmed by the results of recent studies. Kim, Muhn, and Nikolaev[xviii] explored the capability of large language models (LLMs), such as GPT-4, to analyze financial statements like professional human analysts. Given standardized financial data, GPT-4 effectively predicted future earnings directions without needing narrative or industry-specific details, often outperforming human analysts.

The study found that LLMs excel where human analysts typically face challenges and achieve prediction accuracy similar to specialized machine learning models. This success is attributed not to memory of training data, but to generating valuable insights about company performance. Moreover, trading strategies based on GPT's predictions achieved higher Sharpe ratios and alphas compared to those using other models, indicating LLMs could play a significant role in financial analysis and decision-making.

An interesting and potentially very useful line of research on the work of financial analysts may be an attempt to develop measures that describe the accuracy and correctness of valuations. Such measures can be very useful in assessing the quality and reliability of valuations and investment recommendations made by financial analysts.

I believe that further research on firms' valuation methodologies are important for increasing our understanding of the valuation practices of financial analysts. Positive criticism of the deficiencies and irregularities shown in the reports should contribute to improving valuation practice and obtaining better, more reliable, and consequently more useful analytical reports. The ultimate effect of this positive criticism will be increased confidence in financial analysts and better decisions by investors.

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