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The Effect of Inflation, Liquidity, and Capital Structure on Financial Performance of Consumer Goods Companies Listed on IDX

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ABSTRACT
This study is intended to determine the empirical scientific evidence of the effect of inflation, liquidity, and capital structure on financial performance of consumer goods sector of companies listed on Indonesia Stock Exchange (IDX) in the period from 2016 to 2020. Financial performance is measured using ROE, while inflation is proxied by Indonesia's annual inflation rate, liquidity is proxied by CR, and capital structure is proxied by DER. A total of 40 consumer goods companies were sampled in this research. The sample was selected using purposive sampling technique and resulted in a total of 200 observations. Data analysis was carried out using panel data regression using EViews 12 software. The results showed that inflation had a positive and significant effect on financial performance, liquidity had a negative and insignificant effect on financial performance, and capital structure had a positive and significant influence on financial performance of consumer goods companies listed on IDX.

Keywords: *Financial Performance, Inflation, Liquidity, Capital Structure, Consumer Goods Companies*

1. BACKGROUND

Every company certainly has the desire to be successful and big. Large companies also want to prove their capabilities in public by becoming a company that is incorporated in stock exchange. The main goal to be realized by all companies listed on the Stock Exchange is to achieve the greatest possible profit so that the prosperity of the shareholders will be higher. Ways that can be done to achieve these goals include increasing the value of the company, where when the value of a company increases it will attract more investors to invest. The benefits derived from the large number of investments invested are that the company will grow and develop well. [1]. Indonesia Stock Exchange (IDX) consists of various sectors and sub-sectors, and one of them is the consumer goods sub-sector. The consumer goods sub-sector is a sub-sector whose financial reports tend to be stable and is a sector that is able to survive in the midst of Covid-19 pandemic. The panic buying action that occurred in early 2020, especially on the demand for hygiene products, medicines, food, and beverages, made the consumer goods industry companies able to survive in the midst of the threat of this pandemic [2]. According to OJK data, the consumer goods sub-sector has the second largest proportion of market capitalization value in Indonesia after the financial sector, which is 15.16% [3]. This is inseparable from the role of the consumer goods sub-sector in meeting the daily needs of the community. However, according to research conducted by Mirae Asset Sekuritas Indonesia, it was found that in 2018 there was a slowdown in growth in the consumer goods sub-sector [4]. This slowdown is thought to be due to the tighter competition among companies engaged in local and imported products, slowing public purchasing power, and a shift in consumer choice from FMCG products to non-FMCG products. This makes investors to be more vigilant in investing their capital in the

companies they choose in the consumer goods sub-sector. Thus, the company must also pursue a strategy for the company's prospects in the future so that the company's financial performance is getting better and increasing the value of the company. Measurement of financial performance can generally be seen through the profitability of its financial statements. There are several factors that affect a company's financial performance, including liquidity, and the company's own capital structure, as well as inflation from the country where the company is located. Research conducted by Oleka et al., found that inflation has a negative effect on profitability[5]. However, the research conducted by Khan et al., found that inflation affected positively on ROE [6]. In relation to liquidity, research conducted by Nugraha & Haryanto [7] and Jaworski & Czerwonka [8] shows that liquidity has a positive and significant effect on profitability. In a study conducted by Kartikaningsih revealed that the liquidity ratio (CR) shows a positive and insignificant effect on profitability (ROE) [9]. Fransisca & Widjaja in their research found that liquidity has a negative effect on profitability [10]. Meanwhile, according to Latha & Rao [11], Novyanny & Turangan [12], Alarussi & Alhaderi [13], and Anissa [14] in their research show that liquidity has an insignificant effect on profitability. Meanwhile, regarding the capital structure, research conducted by Ebrati et al., show that capital structure has a positive and significant effect on profitability [15]. Another study conducted by Quang & Xin provides the same evidence that capital structure has a positive effect on profitability [16]. Research conducted by Romadhoni & Sunaryo shows that the capital structure (DER) partially has a positive and insignificant effect on financial performance (ROE) [17]. However, research conducted by Nassar [18] and Nini & Patrisia [19] gives different results, where capital structure has a negative and significant effect on profitability. So, from the explanation above, the author wants to conduct further research on the effect of inflation, liquidity, and capital structure on the financial performance of manufacturing companies listed on IDX.

2. THEORETICAL REVIEW

2.1. Theory Overview

The theory used in this study includes the pecking order theory and the signaling theory. Pecking order theory is a theory based on the assumption that dividend policy is rigid, in addition to this theory the company is considered to tend to choose funding from within the company itself, and if the company has to choose funding from outside, then the alternative chosen is securities with the safest risk then the riskiest security. This theory relates to corporate funding which can explain the liquidity and capital structure variables in this study.

While the signaling theory assumes that company managers know more and more complete information about the company, where this information may not be known to much by external parties, such as investors. This will result in an information asymmetry between interested parties [20]. This theory relates to investment decisions that can indirectly explain the company's financial performance variables.

2.2. The Conceptual Definition of Variable

According to Rudianto, financial performance is the result or achievement that has been achieved by company management in managing company assets effectively during a certain period [21]. Financial performance is needed by companies to know and evaluate the level of success of the company based on the financial activities that have been carried out.

The Indonesian Central Bureau of Statistics defines inflation as a continuous upward trend in the overall prices of goods and services. If the price of goods and services in the country increases, inflation will increase [22].

Liquidity according to Fred Weston is a ratio that provides an overview of the company's ability to meet its short-term obligations [23].

According to Fahmi, capital structure is a description of the form of the company's financial proportions, namely between owned capital originating from long-term liabilities and shareholders' equity which is a source of financing for a company [24].

2.3. Hypothesis Formulation

The increase in inflation is indicated by an increase in the prices of goods in general, which makes people's purchasing power decrease. Inflation forces firms to operate at higher costs as a result of rising raw prices for production. This increase in production costs encourages companies to increase the selling price of their goods in order to cover production costs, but on the other hand, people's purchasing power will decrease, which has an impact on company sales which also decline. This causes the company to reduce its operating activities, which will result in a decline in the company's financial performance. Therefore, the research hypothesis was developed as follow:
H_1: Inflation has a negative effect on the company's financial performance.

Basically the liquidity ratio aims to measure the company's liquid assets against its short-term liabilities, where the more liquid assets the company has to cover short-term liabilities, the more likely the company can pay debts when they fall due without running out of funds to support the company's operations and financial performance. ongoing. This indicates that the company has a good financial performance. Therefore, the research hypothesis can be formulated as follow:
H_2: Liquidity has a positive influence on the company's financial performance.

Debt financing is an alternative financing with a lower cost of capital compared to equity, so a high DER should provide a lower cost of capital than a low DER value. The cost of existing capital will reduce the addition to the owner's wealth, because the smaller the interest expense, the greater the additional wealth that can be obtained. Therefore, the research hypothesis can be formulated as follow:
H_3: Capital structure has a positive influence on the company's financial performance.

Based on the research hypothesis that has been formulated above, the research model can be formed as follow:

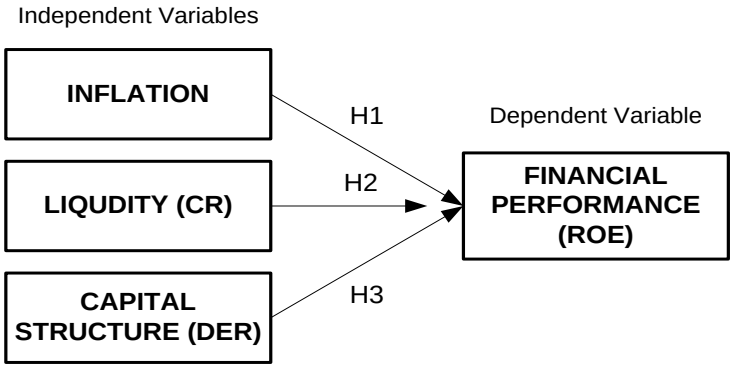

Figure 1 Research Model

3. METHODOLOGY

This research belongs to quantitative descriptive research. Research data is panel data obtained from a number of observations in several companies at different timescales. The research subjects are consumer goods companies listed on Indonesia Stock Exchange with the research year starting from 2016 to 2020. While the object of research is financial performance proxied by ROE, inflation proxied by Indonesia's annual inflation rate, liquidity proxied by with CR, and capital structure proxied by DER.

Table 1 Variable Operationalizations

Variable	Size	Scale
Financial Performance	$\text{ROE} = \frac{\text{Net Income}}{\text{Total Equity}}$ Source: Gitman & Zutter [25]	Ratio
Inflation	Data obtained from BPS [22]	Ratio
Liquidity	$\text{CR} = \frac{\text{Current Asset}}{\text{Current Liabilities}}$ Source: Van Horne & Wachowicz [26]	Ratio
Capital Structure	$\text{DER} = \frac{\text{Total Debt}}{\text{Total Equity}}$ Source: Ross et al. [27]	Ratio

The population in this study are all consumer goods companies listed on Indonesia Stock Exchange. While the sample used in this study was obtained using a purposive sampling technique in which the researcher made criteria and limitations on the subjects to be sampled in the study. The selection criteria consist of: (1) Consumer goods companies listed on IDX; (2) Consumer goods companies listed on IDX with complete financial reports and actively reporting annual financial reports; (3) Consumer goods companies that are listed on IDX and have financial reports for the 2016-2020 period. After going through the sampling process using purposive sampling technique, from a total of 68 companies obtained 40 companies that meet the four criteria.

All research samples were tested for data analysis assumptions using multicollinearity test. Furthermore, the data analysis test was carried out starting with descriptive statistical tests, then evaluate or estimate the most suitable model through a series of tests by applying the Chow, Hausman, and Lagrange multiplier tests. After that multiple regression analysis was carried out, ending with hypothesis testing and coefficient of determination test.

4. DATA ANALYSIS RESULTS

4.1. Multicollinearity Test Result

From the results of the tests that have been carried out using the EViews 12 software, the results of the multicollinearity test are obtained as follows:

Table 2 Multicollinearity Test Result

	INFLATION	CR	DER
INFLATION	1.000000	-0.117796	-0.060292
CR	-0.117796	1.000000	-0.202940
DER	-0.060292	-0.202940	1.000000

From the table above, it can be seen that the value of the correlation coefficient between inflation and CR, inflation and DER, as well as CR and DER, all three have values less than 0.8. Therefore, it can be concluded that from the tests that have been carried out, the results show that there is no correlation between the independent variables used in the study.

4.2. Descriptive Statistics

The results of the descriptive statistics conducted using EViews 12 are as follows:

Table 3 Descriptive Statistics

	ROE	INFLATION	CR	DER
Mean	0.148928	0.028320	3.152969	0.935812
Median	0.109780	0.030200	2.194298	0.642582
Maximum	2.244585	0.036100	98.63435	5.370085
Minimum	-0.467160	0.016800	0.518823	0.069663
Stad. Dev.	0.320929	0.006449	7.045703	0.820347
Observations	200	200	200	200

The table above describes the results of descriptive statistical tests on the data to be used in the study. Statistical tests include the mean, median, maximum and minimum values, as well as the standard deviation of each variable, with a total of 200 data observations.

4.3. The Results of the Best Research Model Selection

4.3.1. Chow Test

The results of Chow test using the EViews 12 software are as follows:

Table 4 Chow Test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	12.549275	(39,157)	0.0000
Cross-section Chi-square	283.041260	39	0.0000

From the results in the table above, it was found that the probability value of the chi-square cross section was 0.0000, which is smaller than which is 0.05. Therefore, it can be concluded that the fixed effect model is better used in research.

4.3.2. Hausman Test

The results of the Hausman test using the EViews 12 software are as follows:

Table 5 Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.062531	3	0.9959

From the statistical test results in the table above, it was found that the probability value of the chi-square cross section was 0.9959. which value is greater than which is worth 005. Therefore, it can be concluded that the random effect model is better used in research.

4.3.3. Lagrange Multiplier Test

The results of the Lagrange Multiplier test using the EViews 12 software are as follows:

Table 6 Lagrange Multiplier Test Results

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	193.7918 (0.0000)	2.077536 (0.1495)	195.8693 (0.0000)

Based on the results in the table above, it was found that the probability value of the chi-square cross section was 0.0000. which is smaller than which is 0.05. Therefore, it can be concluded that from the three tests that have been carried out above, the random effects model was chosen as the best model to be used to regress panel data in this study.

4.4. Multiple Regression Analysis Results

Multiple regression analysis was performed using the EViews 12 software, and from the test the following results were obtained:

Table 7 Multiple Regression Analysis Results

	Coefficient	Std. Error	t-Statistic	Prob
C	-0.053438	0.078568	-0.680147	0.4972
INFLATION	5.119530	1.941889	2.636366	0.0091
CR	-0.000829	0.001993	-0.415719	0.6781
DER	0.064109	0.027453	2.336930	0.0205

Based on the results of data processing in the table above, the regression equation for the study can be formulated as follows:

$$ROE = -0.053438 + 5.119530\ INFLATION - 0.000829\ CR + 0.064109\ DER$$

From the regression equation, it can be concluded that if there is an increase of 1 unit in the inflation variable while other variables remain constant, then the ROE variable will increase by 5,119530 units. And if there is an increase of 1 unit in the CR variable while other variables remain, then the ROE variable will decrease by 0.000829 units. And if there is an increase of 1 unit in the DER variable while other variables remain, then the ROE variable will increase by 0.064109 units. However, if the inflation variable, CR, and DER are 0 then the ROE variable value is -0.053438.

4.5 Hypothesis Test Results

In Table 7 it is found that the significance value of t of the inflation variable is 0.0091, which is smaller than the 0.05 significance value. This indicates that inflation has a significant effect on ROE. The significance value of t on the CR variable is 0.6781. This figure exceeds the significance value of 0.05. This indicates that CR does not have a significant effect on ROE. Furthermore, the t significance value of the DER variable is 0.0205, in which this value is smaller than the 0.05 significance value. This indicates that DER has a significant effect on ROE.

4.6. Coefficient of Determination Test Results

The coefficient of determination test was carried out by observing the results of the multiple analysis test on the Adjusted R-squared section.

Table 8 Coefficient of Determination Test Results

Weighted Statistics			
R-squared	0.057938	Mean dependent var	0.040959
Adjusted R-squared	0.043519	S.D. dependent var	0.176915
S.E. of regression	0.173023	Sum squared resid	5.867615
F-statistic	4.018071	Durbin-Watson stat	2.109322
Prob(F-statistic)	0.008377		

The result of the coefficient of determination test (Adjusted R-squared) in the panel regression analysis in this study was 0.043519 or 4.35%. This means that the contribution of the independent variables in this study, namely inflation, liquidity (CR) and capital structure (DER) in explaining the dependent variable, namely financial performance proxied by ROE is 4.35%.

5. DISCUSSIONS

5.1. Inflation and Financial Performance (Profitability)

From the results of a series of statistical tests that have been carried out, it was found that inflation has a positive regression coefficient value of 5.119530 and a probability value of 0.0091. The regression coefficient figures indicate that inflation has a positive effect on financial performance. That is, the higher the inflation, the company's financial performance will also increase, but conversely if inflation decreases, the company's financial performance will also experience a decline. This makes H1 in the research hypothesis which states that inflation has a negative effect on financial performance is rejected. When inflation occurs, automatically all basic needs prices will rise. If the price of goods rises during inflation, consumers are forced to buy goods sold because these goods are part of their basic needs. In addition, companies will also be encouraged to increase their production goods to meet consumer demand, because the goods they provide are goods that are needed by the community every day. The company will continue to strive to maximize its production and make effective use of capital to gain profits and this will make the company's financial performance better. The results of this study are in line with previous research conducted by Mirza [28], Khan et al. [6], and Vătavu [29] which states that inflation has a positive and significant effect on profitability.

5.2. Liquidity and Financial Performance (Profitability)

From the results of data processing that has been carried out, it was found that liquidity as proxied by CR shows a negative regression coefficient value of 0.000829. The negative CR regression coefficient indicates that liquidity has a negative or non-unidirectional effect on financial performance. This means that if the company's liquidity value is higher, the company's financial performance will decrease, but if the company's liquidity value decreases, the company's financial performance will increase. Meanwhile, from the results of data processing, it was also found that the probability value of CR was 0.6781. The negative and insignificant effect makes H2 in the research hypothesis which states that liquidity has a positive effect on financial performance is rejected. A high liquidity value can indicate that there are a lot of idle company funds, which in turn can reduce the company's profitability. Through this it can be concluded that liquidity can also affect the company's financial performance, although not significantly. The results in this study are in line with the results of research conducted by Fransisca & Widjaja which shows that liquidity does not have a significant effect and has a negative relationship to profitability.[10].

5.3. Capital Structure and Financial Performance (Profitability)

From the results of data processing that has been carried out, it was found that DER has a regression coefficient value of 0.064109. This figure shows that the capital structure has a positive

influence on financial performance. This means, if the company's capital structure increases, the company's financial performance will also increase, but on the contrary if the company's capital structure decreases, the company's financial performance will also decrease. The probability value of 0.0205 owned by DER indicates that the capital structure has a significant influence on the financial performance of the company. This significant positive influence makes H3 in the research hypothesis which states that capital structure has a positive influence on financial performance is accepted. The results of this study are also in line with the Pecking Order theory, where companies prioritize debt financing from creditors, rather than equity financing. If the company is able to use low-cost sources of debt and is able to manage the use of its capital effectively and efficiently, the company will get a high level of profit. A high DER value also indicates the amount of debt used in the company and will have an impact on the ROE value or financial performance. From the results of data analysis, DER has a positive beta coefficient value, which means that with the addition of debt or an increase in the DER value, the ROE value will also increase. These results are in line with the results of research conducted by research conducted by Ebrati et al. [15] and Quang & Xin [16] which state that capital structure has a positive and significant effect on ROE.

6. CONCLUSION

Based on the description that has been presented in the analysis and discussion section, the conclusions that can be drawn from this research are as follows: (1) Inflation does not have a negative effect on the financial performance of consumer goods companies listed on IDX. (2) Liquidity does not have a positive effect to the financial performance of consumer goods companies listed on IDX. (3) Capital structure has a positive influence on financial performance of consumer goods companies listed on IDX.

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REFERENCES

[1] K. Natsir and Y. Yusbardini, “The Effect of Capital Structure and Firm Size on Firm Value Through Profitability as Intervening Variable,” vol. 145, no. Icebm 2019, pp. 218–224, 2020, doi: 10.2991/aebmr.k.200626.040.

[2] A. Hidayat, “Sektor Industri Consumer Goods Masih Optimistis Tumbuh Di Tengah Ancaman Virus Corona,” *industri.kontan.co.id*, 2020. .

[3] OJK, “Statistik Mingguan Pasar Modal 2020,” 2020.

[4] H. P. Saragih, “Terungkap, Ini Penyebab Resesi Ekonomi Global,” *CNBC Indonesia*, 2019. .

[5] C. D. Oleka, E. A. Sabina, and M. I. Ebue, “Relationship Between Inflation and Firms’ Performance-Evidence from Nigeria,” *World Appl. Sci. J.*, vol. 33, no. 5, pp. 814–822, 2015, doi: 10.5829/idosi.wasj.2015.33.05.14584.

[6] W. A. Khan, M. Shahid, R. Bari, W. Anam, N. Shehzad, and S. Siddique, “Impacts of Inflationary Trends on Banks’ Performance(Large Banks Segment) in Pakistan,” *Int. J. Account. Financ. Report.*, vol. 4, no. 1, p. 296, 2014, doi: 10.5296/ijafr.v4i1.6083.

[7] P. S. Nugraha and A. M. Haryanto, "Analisis Pengaruh Sales Growth, ROE, SIZE, TATO, dan Current Ratio Terhadap ROA dan Terhadap Beta Akuntasi Studi Kasus Pada Perusahaan Manufaktur yang Terdaftar di BEI Periode 2010-2014)," *Diponegoro J. Manag.*, vol. 5, no. 1, pp. 1–12, 2016.

[8] J. Jaworski and L. Czerwonka, "Relationship Between Profitability and Liquidity of Enterprises Listed on Warsaw Stock Exchange," *35th Int. Sci. Conf. Econ. Soc. Dev. – "Sustainability from an Econ. Soc. Perspect.*, pp. 326–334, 2018.

[9] D. Kartikaningsih, "PENGARUH DEBT RASIO, CURRENT RASIO, TOTAL ASSETS TURNOVER, SIZE PERUSAHAAN, DAN NET PROFIT MARGIN TERHADAP RETURN ON EQUITY (Studi Kasus Pada Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Indonesia Pada Tahun 2009-2011)," *J. Akunt.*, vol. 1, 2013, doi: 10.24964/ja.v1i2.17.

[10] E. Fransisca and I. Widjaja, "Pengaruh Leverage, Pertumbuhan Penjualan Dan Ukuran Perusahaan Terhadap Profitabilitas," *E-Jurnal Manaj. Univ. Udayana*, vol. 4, no. 7, p. 249411, 2019.

[11] M. Latha and S. N. Rao, "Determinants of profitability: Evidence from listed companies in the bse-fmcg," *Int. J. Econ. Perspect.*, vol. 11, no. 3, pp. 1264–1272, 2017.

[12] M. C. Novyanny and J. A. Turangan, "Pengaruh Likuiditas, Ukuran Perusahaan, Umur Perusahaan dan Pertumbuhan Perusahaan Terhadap Profitabilitas Pada Perusahaan Jasa Terdaftar Pada Bursa Efek Indonesia," *J. Manag. Stud.*, vol. 4, no. 1, pp. 66–78, 2017.

[13] A. S. Alarussi and S. M. Alhaderi, "Factors affecting profitability in Malaysia," *J. Econ. Stud.*, vol. 45, no. 3, pp. 442–458, 2018, doi: 10.1108/JES-05-2017-0124.

[14] A. R. Anissa, "Pengaruh Perputaran Modal Kerja, Pertumbuhan Penjualan, dan Likuiditas terhadap Profitabilitas pada Perusahaan Retail yang Terdaftar di Bursa Efek Indonesia," *Maj. Sainstekes*, vol. 6, no. 2, pp. 125–145, 2019, doi: 10.33476/ms.v6i2.1197.

[15] M. R. Ebrati, F. Emadi, R. S. Balasang, and G. Safari, "The Impact of Capital Structure on Firm Performance: Evidence from Tehran Stock Exchange," *Aust. J. Basic Appl. Sci.*, vol. 7, no. 4, pp. 1–8, 2013.

[16] D. X. Quang and W. Z. Xin, "Measuring Impact of Capital Structure on Financial Performance of Vietnamese Soes," *Innov. J. Bus. Manag.*, vol. 4, no. 6, pp. 114–117, 2015.

[17] Romadhoni and H. Sunaryo, "Pengaruh Struktur Modal Terhadap Kinerja Keuangan Perusahaan Manufaktur Sektor Makanan dan Minuman Yang Terdaftar di Bursa Efek Indonesia 2013-2016," vol. 6, no. 6, pp. 219–232, 2017.

[18] Nassar, "The Impact of Capital Structure on Financial Performance of the Firms: Evidence From Borsa Istanbul," *J. Bus. Financ. Aff.*, vol. 5, no. 2, pp. 2–6, 2016, doi: 10.4172/2167-0234.1000173.

[19] Nini and D. Patrisia, "Pengaruh Struktur Modal Terhadap Kinerja Keuangan Perusahaan the Effect of Capital Structure on the Firm," no. 2012, 2019, doi: 10.21831/economia.v16i2.30661.

[20] J. Hartono, *Teori Portofolio dan Analisis Investasi*, Sebelas. Yogyakarta: BPFE, 2013.

[21] Rudianto, *Akuntansi Manajemen Informasi untuk Pengambilan Keputusan Strategis*. Jakarta: Erlangga, 2013.

[22] BPS, "No Title," 2021. .

[23] Kasmir, *Analisis Laporan Keuangan*. Jakarta: Raja Grafindo Persada, 2008.

[24] I. Fahmi, *Analisis Laporan Keuangan*. Bandung, 2017.

[25] L. J. Gitman and C. J. Zutter, *Principles of Managerial Finance*, 14th ed. Harlow: Pearson Education, 2015.

[26] J. C. Van Horne and J. M. Wachowicz, *Prinsip-Prinsip Manajemen Keuangan*. Jakarta: Salemba Empat, 2012.

[27] S. A. Ross, R. W. Westerfield, J. Jaffe, and B. D. Jordan, *Corporate Finance*, 11th ed. New York: McGraw Hill Education, 2016.

[28] A. Mirza, "Determinants of financial performance of a firm: Case of Pakistani stock market," *J. Econ. Int. Financ.*, vol. 5, no. 2, pp. 43–52, 2013, doi: 10.5897/jeif12.043.

[29] S. Vătavu, "The Impact of Capital Structure on Financial Performance in Romanian Listed Companies," *Procedia Econ. Financ.*, vol. 32, no. 15, pp. 1314–1322, 2015, doi: 10.1016/s2212-5671(15)01508-7.