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Analyzing the Factors Influencing Market Return using Capital Asset Pricing Model and Arbitrage Pricing Theory

Mostofa Mahmud Hasan, Md. Motahar Hossain, Md. Tahidur Rahman

[1]Department of Business Administration,
Khwaja Yunus Ali University, Sirajganj, Bangladesh

[*2]Department of Business Administration,
Khwaja Yunus Ali University, Sirajganj, Bangladesh

[3]Department of Business Administration,
Bangladesh Army International
University of Science and Technology (BAIUST), Bangladesh

Abstract

The paper identifies the determinants of sectorial stock returns in Dhaka Stock Exchange (DSE) based on the Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT). The study uses secondary information of 150 stocks that are actively traded (January 2021 thru February 2025) and examines how macroeconomic variables, namely GDP growth, money supply, inflation, and interest rate, can affect sector returns. Different relationships were estimated by the use of Ordinary Least Squares (OLS) and Weighted Least Squares (WLS) regression methods across the key sectors. The result suggests that all the four macroeconomic variables have a major influence on the returns of the banking sector whereas other sectors are not very sensitive. Findings indicate that the one-factor model of the CAPM does not explain complexities in the market, whereas the use of the APT offers a broader model in explaining the variations in the sectors. The findings have significant implications to investors, policymakers, and researchers who would like to know the risk-reward dynamics in the emerging market such as Bangladesh.

Keywords: DSE, Stock Return, APT, CAPM, Bangladesh.

1. Introduction

The stock market is considered the indicator of economic health affecting the decisions about investment and capital formation. In emerging markets like Bangladesh, the determinants of stock returns can only be known to enhance the efficiency of the market and investment strategies (Chowdhury, 2024). This paper re-examines the relevance of CAPM and the

Arbitrage Pricing Theory (APT) in interpreting sectorial returns of the Dhaka Stock Exchange (DSE) in terms of applicability of macroeconomic variables in form of GDP growth, money supply, inflation and interest rates.

Expansion of the stock market creates diverse range of equity investment opportunities. Potential profits from equities in a rising market like Bangladesh are attracting the attention of investors from all around the world. Excitement of local and international investors is of utmost important to fuel Bangladesh's stock market through additional funding (Islam, & Hossen, 2025). However, the abrupt collapse of the Bangladesh stock market in the mid-1990s and during 2010-11 caused a significant impact on investor confidence. Following this, the Bangladesh Securities and Exchange Commission (BSEC), DSE, and Chittagong Stock Exchange (CSE) all took action that helped regain investors' faith in the market (Rahman, et al., 2017). To prevent harmful market acts, several rules have been put into place, including lock-in requirements, circuit breakers, and prohibitions on insider trading (Chowdhury, 2023). However, a significant number of individuals continue to perceive investment in the stock market as risky due to the nation's political, economic, and social instability. Investors do not estimate a high investment in holding stocks of large caps even in the forecast of market illiquidity. A good indicator of the position of investors on the market is turnover in the market. A market turnover can be regarded as positive proxy of the investor mood and confidence, indicative of the quantity of trading activity in the stock market. The high turnover is correlated with optimistic investor sentiment since it is a sign of increased buying and selling (Dissanayake, & Nanayakkara, 2025).

The Capital Asset Pricing Model (CAPM) is more compatible with two-step regressions as they incorporate country risk factors, and most of them rely on credit default swap and bond default spread proxies. The CAPM is actually more efficient when the risk free rate is an external factor. When the market is on the upswing, the stock is expected to be on the upswing and vice versa. Positive beta indicates that a stock tends to be market-dependent and thus it is likely to go in line with the market trend (Muzindutsi, 2024). The actual stock returns show a negative relationship existing between the rate of inflation and the performance of the stocks. In real stock returns, the exchange rate actually does not significantly affect stock returns (Riantani, & Komariah, 2024). Despite extensive research on CAPM, there is a very large disparity in the performance of CAPM and Arbitrage Pricing Theory (APT) in emerging markets such as Bangladesh. Nevertheless, there is a discussion on the most important risk factors of emerging countries, despite APT offering a framework of multi-factors (Poncet, & Portait, 2022). It also seems that there is a gap in knowledge about the effectiveness of these models in hard economic times or crisis as the majority of the earlier studies have examined them in more stable market settings. These gaps should be addressed so as to improve the asset pricing models and investment plans in emerging countries. The paper concentrates on the DSE risk-return variables in various sectors.

2. Review of Literature

The effects of macroeconomic variables on bank returns may be positive or negative and these may be influenced by the market conditions prevailing at the given time. The rate of GDP growth exhibits a significant effect on the returns of the banks in the bull markets, but did not affect Capital or Investment significantly. In addition to this, the returns on banks is positive and rising in case of bull market and in the case of bear markets, the returns of certain banks can be negative and substantial. The actual effective exchange rate has various effects on different banks in bear markets, and its effects on different institutions are different. Therefore, the model between macroeconomic variables and the profitability of banks is not linear and behaves differently in different economic environments (Mofokeng, & Moodley, 2025). The short-term analysis indicates that money supply and exchange rate between the United States dollar (USD) and Nepalese Rupee negatively affect the stock market, whereas inflation rates and interest rates did not appear to have a major effect (Jnawali, & Thapa, 2021).

The market value management (MVM) and liquidity management (LM) have a significant contribution in the working of the U-shaped relationship between the management of shareholder equity and the performance of the firm. Good MVM increases performance in the market and keeps investors contented whereas LM contributes to financial stability and flexibility which is extremely essential in addressing the unpredictable financial circumstances (Zhu, et al., 2025). There is a positive relationship exist between the market capitalization (MC) and three financial variables, including price/earnings ratio (PER), earning per share (EPS), and working capital per share (WCS) (Pavone, 2019). The market capital is also associated with negative correlations with three other financial ratios, including the return on equity (ROE), the return on assets (ROA) and the earnings yield (EYA). Some of the possible indicators of capitalization trends that managers may wish to look into include the PER, EPS, and WCS despite the fact that the relationships do not necessarily lie very close.

CAPM provides investors with a sound method of determining the relationship between risk and expected return, which assists an investor to enhance his/her investments. CAPM can be a useful tool in determining the expected returns of the individual stock based on the risk profile of the respective stocks. The model offers a means of estimating systematic risk (beta) indicating the extent to which the returns of a stock are likely to vary whenever the market is rising and falling. CAPM also assists in calculating the returns expected to occur through examination of the risk-free rate as well as market returns and thus it becomes easier to determine whether stock is a good bargain. It is very important to find methods of managing the risks posed by market fluctuations and moves in stock mixes. Moreover, investing in high-dividend stocks may be a clever idea to get a consistent income, and some useful hints to people, who want to maximize their investments in the stock market. Added to that, it has a large market cap and high dividend yields, which makes it an excellent investment choice to all individuals who want to have some

passive income. CAPM will produce superior results compared to other methods of investment, which explains why the tool is so reliable in efficiently managing portfolios (Markowitz, 1952). Beta (B) is crucial in calculating the returns and it is usually assumed to be a Best Linear Unbiased Estimator to enhance the degree of accuracy in prediction.

On the other hand, APT is introducing a ton of other economic factors such as inflation and exchange rate fluctuations. It is convenient to select the best model to predict the stock returns to make wise decisions on your portfolio particularly LQ45 with the big and liquid stocks. CAPM, in its simplicity, may satisfy some people, but APT might be a more appropriate way to explore the relationship between macroeconomic factors and price changes of stock (Auditiyah, et al., 2025). CAPM is premised on a single risk factor. It discusses the effects of various macro-economic variables such as interest rates and inflation on the expected return on an asset, which is useful in explaining the dynamics of the market. Alternatively, ATP is founded on the principle of arbitrage that states that the differences in prices of the efficient markets are fixed promptly and asset prices are kept reasonable (Zahroh, et al., 2024). Some of the main findings as to the extent of effectiveness of the CAPM and the APT were made by Wang (2025). Accordingly, scholars have some debate regarding the best model to predict stock returns (Wang, et al., 2025). Moreover, the majority of industry-specific research is based on such industries as natural resources and energy, which implies that industry research, is not very diverse. The reviewed studies use different methodologies, most of them being regression analysis and time-series analysis, but their comparative effectiveness between the two models is uneven. Ultimately, the findings suggest that neither CAPM nor APT is universally superior, and the choice between them should be context-dependent, considering the specific market factors at play. Analyzing the above literature it is observed that most of the researchers investigate the impact of selected variables on stock return of a specific sector. But the current study focused on demonstrating the impact of each variable (GDP growth, Money supply, Inflation and Interest rates) on stock return of most of the sectors' DESE listed companies.

3. Objectives and Hypotheses

The study aims to:

i) Research the DSE on the correlation between the macroeconomic variables and the sectorial stock returns.

ii) Compare the ability of CAPM and APT models to explain sector returns.

iii) Determine the industries that are the most vulnerable to macroeconomic changes.

According to the literature, the research hypotheses are as follows:

- H_1: Macroeconomic variables do not have a significant impact on sectorial stock returns in the DSE.
- H_2: APT model is a better model of explaining sectorial returns than the CAPM.
- H_3: The banking and garment industries are more responsive to changes in the macroeconomic factors as compared to other industries.

4. Methodology

The research used 150 actively-traded companies that were listed on the Dhaka Stock Exchange in the period of January 15, 2021, to February 28, 2025. The DSE database, the Bangladesh Bank publications and International Finance Statistics (IFS) were used as the sources of data. Sectorial returns were calculated taking into account capital gains as well as dividends. The dependent variable in the study is the sectorial stock return which the independent variables are GDP growth, money supply (M2), inflation rate and short-term interest rate. Ordinary Least Squares (OLS) and Weighted Least Squares (WLS) regression methods were utilized in testing the hypotheses on both CAPM and APT models.

The general APT model is expressed as: $E(Rj) = Rf + \beta j1\lambda 1 + \beta j2\lambda 2 + \ldots + \beta jn\lambda n + \varepsilon j$.

Where E(Rj) represents expected return, Rf is the risk-free rate, βjk denotes sensitivity to factor k, and λk indicates the corresponding risk premium. Control variables such as exchange rate and market turnover were incorporated to account for liquidity and external shocks.

5. Results and Discussion

Table 1: Market Capitalization

Year	Market Capitalization in BDT Million	Market Capitalization in USD Million	% of Annual Growth	Market Capitalization/GDP
2021	63,769.00	1,118.75	1.34	.0296
2022	71,261.75	1,228.65	11.75	.0251
2023	97,442.26	1,668.53	36.74	.0411
2024	224,159.21	3,831.78	130.04	.089

Source: DSE website

Stock Market	Indices (2023)	Indices (June 2024)	Listed Issues	Market Cap (USD mn, 2023)	Turnover (USD mn, 2023)	Market Cap as % of GDP (2022)
Germany	3965.2	4084.63	684	1079026	1147209	34.57
Mumbai	1531.4	1886	5644	279093	284802	25.78
Dhaka	973.88	1318.92	267	1668	327	2.51
Karachi	4471.6	5299.81	701	16579	66598	17.27
Kuala Lampur	823.68	821.01	897	168376	50135	130.53
Singapore	1764.5	1840.84	475	145117	6141	117.17
Philippines	1442.4	1579.4	234	23565	2635	50.06
USA	1111.9	1136.2	5295	14266266	15547431	106.45
Colombo	1897.8	1358.5	215	2711	73838	10.12
Japan	1043.7	1167.1	3116	3040665	2272989	39.4
London	4476.9	4509.9	2311	2412434	2150753	119.9
Thailand	772.1	644	405	118705	96573	36.31
Hong Kong	12575.9	12278.61	1029	714597	331615	286.7

Source: Authors' Calculation based on DSE website

Table 3: Turnover and Liquidity in DSE

Year	Volume in million	Value (BDT Million)	Value (USD million)	% of Annual growth	Turnover/ Market Capitalization
2021	1,107.20	39,869.29	699.46	(1.00)	.017363
2022	1,309.14	34,984.32	603.18	(12.25)	.018373
2023	612.74	19,152.27	327.95	(45.25)	.006288
2024	681.38	53,181.17	902.91	177.68	.00304

Source: DSE website

Table 4: Initial Public Offering (IPO) in DSE

Year	No. of public issues	Volume of public offer (Tk. Million)	Volume of public offer (USD Million)	% of Annual Growth	Volume of Pre IPO placement (BDT Million)	Volume of Pre IPO placement (USD Million)	% of Annual Growth
2020	7	122.50	2.27	(64.49)	290.25	5.38	(55.35)
2021	11	220.00	3.86	79.59	309.64	5.43	6.68
2022	8	198.00	3.41	(10.00)	252.19	4.35	(18.55)
2023	14	1351.17	23.30	582.41	1626.50	27.85	544.95
2024	3	473.88	8.10	(64.93)	20.00	0.34	(98.77)
2025	17	1265.70	19.13	167.09	145.90	2.21	629.50

Source: DSE website

Beck et al. (2000) and Demirgüç-Kunt et al. (1995) offered financial metrics for studying stock market development across nations and over time (Beck, et al., 2000; Demirgüç-Kunt, & Levine, 1996). Because of this, the research was able to compare the growth of Bangladesh's stock markets to that of other countries in the same industry. Table 1 shows the stock market's relative size that has been growing since 2021 in of DSE), which is defined as the ratio of market capitalization to GDP. It is evident that the ratio in the South Asian region is 10–25% and in industrialized countries it ranges from 34–286%, yet during this time, Bangladesh's stock market remained tiny, at 3–9%. Market capitalization, however, grew at its fastest ever yearly rate in 2024. According to Table 2, when compared to other local and regional markets, DSE still has a very small number of listed stocks. The turnover ratio, which is considered as the value of total shares traded divided by market capitalization, also indicates that the stock market's liquidity is poor compared to the world standards. Table 3 shows that market liquidity is becoming increasingly low over time. Market capitalization has been growing at a far faster rate than total turnover on the DSE. When compared to other global markets, both the market capitalization and the value of stocks handled are very small in Bangladesh. The DSE also has very unpredictable trading volumes. In addition to liquidity issues, the delisting of equities on the market was a measure of the business losses endured by the DSE. A rising number of securities have been delisted from the DSE in the past few years. Although startups encounter difficulties on a regular basis, 2024 was an especially trying year for them. During this time, the amount of the public offer was negatively correlated with the number of enterprises listed annually (see Table 4). Between 2020 and 2022, there was a decline in the number of the DSE's public offer. The situation, however, improved dramatically in 2025.

Table 5: Sector-wise Stock Return and Risk

Industry	**Standard Deviation**	**Avg. Return**
Service	104.844	-0.001
Investment	3.337	0.032
Insurance	0.007	0.052
Fuel & Energy	5.348	0.039
Food & Allied	5.927	-0.01
Banks	1.73	0.084
Engineering	3.112	0.038
Garments	5.275	0.136
Pharma. & Chemicals	4.375	0.025
Miscellaneous	9.754	2.094

Source: DSE website

As shown in Table 5, the current study categorizes DSE listed companies into eleven categories: banking, investments, engineering, food and allied, fuel and energy, clothes, pharmaceuticals and chemicals, services, insurance, and miscellaneous. Next, it goes on to analyze the return characteristics of each category. In the calculation of return, this research has used the following formula:

$$R_i = \frac{(P_t - P_{t-1}) + D_t}{P_{t-1}}$$

Where market price of the current month is denoted by Pt, market price of the previous month is Pt-1, and the dividend declared at the given time is indicated by Dt.

To reflect the effect on stock price, the study adjusted the dividend according to the declaration date. The monthly return standard deviation has been used to evaluate the equity risk. According to a 48-month study of the selected 150 stocks' monthly closing data, the garment industry produced the best return. The return of the garment industry during this period was 13.55%, accompanied by a standard deviation of 5.4727 (See Table 5). Second place goes to the banking sector, which returned 8.42% over the period, followed by the insurance sector with a return of 5.16%. During this period, the service sector and the food and related industries both produced negative returns. During the same time, the engineering, pharmaceutical, and other related industries also generated excellent profits. The banking industry ranks first overall when considering the risk-return trade-off. Among the sectors that had positive returns during this time, the Pharmaceuticals and Chemicals sector had the highest risk-to-reward ratio.

The current study examines price variations to explain the return characteristics of DSE-listed companies. The authors' approaches to analyzing stock returns vary. Instead of calculating stock returns, this research seeks to understand macroeconomic factors that affect diversity. Diversification can reduce changes in returns that aren't linked to the common components because the differences in returns for each firm are not related to each other. Assuming the above assumptions, Ross believes an asset's predicted profit should be directly proportionate to its sensitivity to shared factors in order to avoid arbitrage. The study examined stock fundamentals, economic determinants that explain sector returns, and irrational herding. This article focuses on DSE risk-return factors across diverse sectors. Researchers conducted the study to determine the industry with the lowest risk and highest return.

The term structure of interest rates, industrial production, risk premium, and inflation were determined to be the four independent variables that may be used as forecasts. APT testing has been conducted for the entire stock group. Four macroeconomic variables have been selected by researchers to clarify sector-wise returns: absolute GDP growth, broad money supply growth, short-term interest rates, and inflation.

Segments	R	R Square	Adjusted R Square	Standard Error
Banking	.995	.990	.965	.082698550
Investment	.840	.705	-.032	.09271487
Engineering	.767	.588	-.443	.260648950
Food & Allied	.965	.931	.760	.0902167965
Garments	.594	.353	-1.265	.55486801
Pharmaceuticals & Chemicals	.886	.784	.245	.13114942
Paper & Processing	.751	.564	-.526	.271347263
Service	.976	.953	.837	.08510166
Insurance	.873	.762	.168	.194486501
Miscellaneous	.873	.762	.168	.194486501

Predictors: (Constant), M2, GDP (g), Inf, Int Rate, **Source:** Authors' Calculation

Table 7: Correlation Coefficients

Dependent variable	Beta	T-statistics	P-value
Banking Sector		-9.050	.012
	-4.557	-9.136	.012
	14.576	9.143	.012
	2.882	7.844	.016
	6.994	9.598	.011
Investment Sector		-1.672	.236
	-4.153	-1.536	.264
	14.185	1.642	.242
	3.262	1.638	.243
	6.501	1.646	.241
Engineering Sector		.076	.947
	1.725	.540	.643
	-1.778	-.174	.878
	-.665	-.283	.804
	.498	.107	.925
Food & Allied Sector		-3.265	.082
	-3.651	-2.798	.108
	13.295	3.188	.086
	2.581	2.686	.115
	6.861	3.599	.069

Garments Sector		-.018	.987
	1.082	.270	.812
	-.523	-.041	.971
	-.353	-.120	.916
	.668	.114	.920
Pharmaceuticals &		-2.618	.120
Chemicals Sector	-2.412	-2.247	.154
	8.582	2.501	.130
	2.072	2.621	.120
	4.453	2.839	.105
Paper & Processing		-.853	.483
Sector	-3.007	-.915	.457
	9.496	.904	.461
	1.052	.434	.706
	4.445	.926	.452
Service Sector		-.879	.472
	-1.987	-.859	.481
	6.287	.851	.485
	1.656	.972	.434
	3.387	1.003	.422
Insurance Sector		-.687	.563
	-1.855	-.764	.525
	5.371	.693	.560
	1.288	.721	.546
	2.863	.808	.504
Miscellaneous Sector		-.687	.563
	-1.855	-.764	.525
	5.371	.693	.560
	1.288	.721	.546
	2.863	.808	.504

Predictors: (Constant), M2, GDP (g), Inf, Int. Rate, **Source:**Authors' Computation

Employing linear regression analysis (Table 6 and 7), researchers have investigated the impact of macroeconomic variables on the segment-specific incomes of the DSE. Data pertaining to macroeconomic variables is also gathered on a half yearly basis. The returns of banking sector stocks, as classified in this analysis, are primarily influenced by macroeconomic factors. The banking sector's returns are substantially influenced by all four elements. Almost 96% of the volatility in banking sector returns can be recognized to these four macroeconomic variables. The sectors of investment, engineering, garments, paper and processing, service, insurance and miscellaneous exhibit minimal influence from any of these four variables. This observation

holds at a 5% significance level, these four variables do not influence the return of the food and allied industry. Returns in the pharmaceuticals and chemicals sector are substantially influenced by inflation rates at a 10% significance level.

The results of the regression indicate that there is a significant sectorial variation to the macroeconomic variables. The banking industry has the greatest explanatory power (R 2 = 0.99), which validates that GDP growth, money supply, inflation and interest rates explain 96 percent of the variation in returns. On the other hand, other sectors like garments as well as services are less sensitive and this suggests that there may be non-macroeconomic forces such as firm specific and behavioral forces.

6. Conclusion and Implications

This study intends to analyze how large economic factors affect returns in different sectors and their related characteristics. The resurgence of the maximum sector eludes explanation through macroeconomic variables, suggesting the presence of alternative influencing factors. The study findings revealed that stock returns of banking sector was significantly influenced by the four macroeconomic variables such as GDP growth, money supply, inflation rate and interest rate. On the other hand the researchers observed that the investment, engineering, garments, garments, paper and processing, service, insurance and miscellaneous sectors were influenced slightly by the macroeconomic factors. Moreover, the four independent variables don't influence the food and allied industry significantly at 5% significance level. However the relationship is significant when the significance level is 10%. Additionally stock returns of pharmaceuticals and chemicals sector were significantly impacted by the four factors.

This study highlights that macroeconomic dynamics significantly affect sectorial stock returns in the Dhaka Stock Exchange. While the CAPM provides a basic understanding of risk–return relationships, the APT offers a more comprehensive and empirically robust explanation. Policymakers ought to work on stabilizing inflation and interest rates so as to facilitate sustainable market performance whereas investors ought to diversify their portfolios in less volatile markets. The results highlight the importance of constant observation of macroeconomic factors to support investment and regulatory policies.

7. Limitations and Future Research Directions

The research has its weaknesses which should be mentioned. First, the limitations of data can affect the quality of the results because the availability and quality of financial data are crucial to the accuracy of the model. Furthermore, CAPM as well as the APT are based on conceptual premises, such as market efficiency and rational investor behavior. In addition, the selection of risk factors in the APT model is subjective and this could impact on the results. Lastly, the analysis does not take into account new financial innovations or global market forces that could

have an impact on the stock returns. In future, behavioral and international variables should also be included in the research in order to enhance the predictive power of asset pricing models.

References

1. Chowdhury, E. K. (2024). Role of Stock Exchanges in Regional Economic Progress: A South Asia Perspective. pp.10-22.

2. Islam, M. T., & Hossen, M. B. (2025). Contemporary and prospective economic conditions of Bangladesh. In Economic Diplomacy: Reshaping Bangladesh-Latin American Diplomatic Relations (pp. 75–100). Cham: Springer Nature Switzerland.

3. Rahman, M. T., Hossain, S. Z., & Habibullah, M. (2017). Stock market crash in Bangladesh: The moneymaking psychology of domestic investors. *American Journal of Theoretical and Applied Business*, *3*(3), 43–53.

4. Chowdhury, H. A. (2023). An insight into the legislative reforms for the development of Bangladesh stock market (Doctoral dissertation, University of Dhaka).

5. Dissanayake, D. M. T. R., & Nanayakkara, N. S. (2025). Role of market liquidity in sentiment-based return predictions: evidence from Sri Lanka. *International Journal of Economics and Financial Issues*, 15(2), 201–210. DOI: https://doi.org/10.32479/ijefi.18020.

6. Muzindutsi, P.-F. (2024).The pricing of the country risk premium on the Johannesburg stock exchange. *Review of Integrative Business and Economics Research,* 14(1), 393–407.

7. Riantani, S., & Komariah, S. (2024). The application of APT in predicting the stock performance through a macro variable model approach. *Economics and Business Quarterly Reviews*, 7(4), 1–11. doi: 10.31014/aior.1992.07.04.613.

8. Poncet, P., & Portait, R. (2022). Arbitrage pricing theory and multi-factor models. In capital market finance: an introduction to primitive assets, derivatives, portfolio management and risk (pp. 963–990). Cham: Springer International Publishing.

9. Mofokeng, T., & Moodley, F. (2025). The effects of changing macroeconomic conditions on the commercial bank returns in South Africa. *International Journal of Economics and Financial Issues*, 15(2), 76–90.

10. Jnawali, G., & Thapa, K. S. (2021). Impact of macroeconomic variables on the development of the Nepalese stock market: A long-run and short-run analysis. *Academic Journal of DAMC.* 2, 60–86.

11. Zhu, C., Liang, X., & Yao, J. (2025). The role of market value management and liquidity management in the shareholder equity management-firm performance relationship. *Cogent Business & Management*, 12(1), 2464950.

DOI:https://www.tandfonline.com/action/showCitFormats?doi=10.1080/23311975.2025.2464950.

12. Pavone, P. (2019). Market capitalization and financial variables: evidence from Italian listed companies. *International Journal of Academic Research Business and Social Sciences,* 9(3), 1356–1371. doi: 10.6007/IJARBSS/v9-i3/5802.

13. Markowitz, H. (1952). Modern portfolio theory. *Journal of Finance*, *7*(11), 77-91.

14. Auditiyah, C., Farida, Y., & Utami, W. D. (2025). Implementation of capital asset pricing model in optimal portfolio formation on IDX high dividend 20. *JTAM (Jurnal Teori dan Aplikasi Matematika)*, 9(1), 257–273.

15. Zahroh, F., Irmadariyani, R., & Wardhaningrum, O. A. (2024). Komparasi capital asset pricing model dan arbitrage pricing theory dalam Memprediksi return saham. Diversification: *Journal of Economics and Management Studies,* 1(1), 1–13.

16. Wang, Z. (2025). Comparison of CAPM and APT. *In International Workshop on Navigating the Digital Business Frontier for Sustainable Financial Innovation (ICDEBA 2024)* (pp. 345–353). Atlantis Press.

17. Beck, T., Demirgüç-Kunt, A., & Levine, R. (2000). A new database on the structure and development of the financial sector. *World Bank Economic Review,*14 (3), 597–605.

18. Demirgüç-Kunt, A., & Levine, R. (1996). Stock market development and financial intermediaries: stylized facts. *The World Bank Economic Review*, *10*(2), 291–321.