



The Effect of Momentum and Liquidity Factors on Stock Returns in the Iraqi Stock Exchange: An Analysis Utilizing the Six-Factor Fama-French Model and Random Forest Methodology

Aseel Riyadh Joodi *  

Department of Accounting Techniques
Technical College of Management/Baghdad,
Middle Technical University, Baghdad, Iraq.

* Corresponding author

Shatha Abdul-Hussein Jabr  

Middle Technical University,
Baghdad, Iraq.

Received: 23/9/2025

Accepted: 16/11/2025

Published: 1/12/2025



© 2025 The authors(s). This is an open-access article under the CC BY NC 4.0 license (<https://creativecommons.org/licenses/by-nc/4.0/>).

Abstract:

This research investigates the influence of momentum and liquidity factors on stock returns in the Iraq Stock Exchange, employing the six-factor Fama-French model and enhancing the analysis with sophisticated machine learning techniques, including Random Forests. This research seeks to address deficiencies in prior studies by implementing an integrated model within the Iraqi market context, which is under-researched in the context of multi-factor asset pricing models. A quantitative analytical approach was applied to a sample of 10 companies listed on the market from 2014 to 2023. The findings indicate that the random forest model markedly outperforms conventional regression models, elucidating 72% of the variance in stock returns and attaining prediction accuracy of up to 85%, as demonstrated. Examination of the significance of variables, the momentum and liquidity factors are the predominant influences in the analysis of stock returns within the Iraqi market. This can be achieved by underscoring the significant impact of non-traditional factors on emerging markets. The research offers significant insights for investors and decision-makers, emphasizing the necessity of incorporating sophisticated risk variables into their investing plans.

Keywords: FAMA and French Hexagonal Models, Random Forests, Stock Returns, Asset Pricing Models, Quantitative Analysis, Multi-Factor Models, Momentum and Liquidity Factors. Iraqi Stock Exchange: Profitability and Investment

1. Introduction:

This paper introduces the capital asset pricing model. Financial research has aimed to create more intricate models that incorporate supplementary factors influencing stock returns, exemplified by the Fama and French model, which integrated volume and value factors (Alrabadi & Alrabadi, 2018) and subsequently expanded to encompass profitability and investment factors (Prasad et al., 2024). Although these models have attained significant success in analyzing stock returns in developed markets (Alrabadi & Alrabadi, 2018), their efficacy may differ in emerging markets, which are distinguished by unique attributes such as elevated volatility, restricted liquidity, and the influence of unconventional factors (Hirshleifer, Dat Mai, Kuntara, Pukthuanthong et al., 2023). This paper aims to implement the Fama and French six-factor model on the Iraqi Stock Exchange and improve its analytical capacity through sophisticated machine learning techniques such as random forests (Garmash & Ai, 2025). This application is a crucial advancement in enhancing our comprehension of the dynamics that regulate this market and offering a more precise analytical framework for investors and decision-makers regarding the formulation of more efficient investment strategies (Sheng et al., 2025).

2. Literature Review and Hypothesis Development:

The study of Doğan et al., (2022) which the objective of this study was to test the validity of the asset pricing model, which now encompasses six parameters, including the momentum factor. It has accomplished its goal by examining the nested asset pricing models of ISTX and determining various capacities to choose which model most accurately elucidates stock returns. A total of 9,504 stocks were utilized for a duration of 396 weeks, spanning from October 2013 to May 2021. The returns were allocated to 24 distinct portfolios. The research study concluded that the FAMA-French six-factor asset pricing model (FF6F) is the most effective method for comprehending stock returns on the Istanbul Stock Exchange. It is predicated on four factors: book value/market capitalization, profitability, investment, and momentum. The momentum factor is a consideration for investors, as it contributes to enhanced returns. Investors should contemplate this before making investment selections. Methods for Executing a Research Study Incorporating a research study into the knowledge base would involve designating the momentum element as a consideration in investment decisions.

A research project by Darma et al., (2024) employed the 100 Kompas index as a case study and utilized two-stage multiple regressions with portfolio configuration based on SMB criteria (HML, RMW, CMA, and UMD). Research indicates that the Fama and Six-Factor franchise model has not surpassed the Fama and French five-factor model in constructing a 2x3 portfolio. Nonetheless, it can surpass the five-factor franchise model, FAMA, and the five factors when constructing a 2x2 portfolio. The addition of a single risk factor diminishes risk variance relative to the variation in the returns of the constructed portfolio. Despite the great success of multi-factor asset pricing models such as the three- and five-factor model of FAMA and French in interpreting equity returns in developed markets, their applications in emerging markets are still limited and show mixed results. Previous research that has applied these models in similar markets suggests that the characteristics of these unique markets, such as limited liquidity, high volatility, and the influence of behavioral factors, may require more comprehensive models beyond traditional factors (size, value, profitability, and investment).

In this context, the importance of integrating additional factors such as momentum and liquidity to provide a deeper understanding of market dynamics based on these observations is highlighted. This research aims to test the extent to which the Fama-French model with six factors which can interpret the returns of equities in the Iraqi stock market. These additional factors may have a significant impact, and accordingly, the first hypothesis of this research is formulated as follows: Alternative Hypothesis (H1): The six-factor model of Fama and French which includes factors of volume, value, profitability, investment, momentum, and liquidity positively and tangibly affects the explanation of the variation in equity returns in the Iraqi stock market.

Null Hypothesis (H0): The six-factor model of Fama and French does not significantly affect the explanation of the variation in equity returns in the Iraqi stock market.

3. Research Methodology:

This research employs a quantitative analytical approach, focusing on collecting and statistically analysis of historical financial data to draw findings regarding the link between research variables. This method seeks to evaluate hypotheses via mathematical and statistical models, enabling the derivation of objective conclusions grounded in numerical data.

3.1 Data collection and research sample:

The financial statements of the ten companies listed in the research were obtained from official secondary sources, namely the Iraqi Securities Commission and the Iraq Stock Exchange (ISX), in addition to the official websites of the companies and the published annual financial reports. The analysis includes the decade from 2014 to 2023. The sample included ten companies selected based on the availability of harmonized and uninterrupted financial statements in the Iraq Stock Exchange throughout the study period (2014-2023). The study is based on annual data and is the necessary and appropriate frequency of the investment variable, which is usually built on the basis of the annual growth of assets, and to enable comparison with international studies that use this frequency in emerging markets.

3.2 Research variables:

The research variables are categorized into:

1. The Dependent Variable: Stock Return: This variable, which the research aims to elucidate, is quantified by the relative variation in the stock price.
2. The Independent Variables: Components of the Fama and French Hex (FF6F) model (Alajmi, 2025).
3. Volume Factor (SMB): Assesses the incremental return generated from investing in small enterprises compared to giant corporations (Maaroof et al., 2025).

$$SMB = R_{Small} - R_{Big} \dots (1)$$

4. Value Factor (HML): Assesses the excess return generated from investing in value equities relative to growth stocks (M. Nadhim et al., 2025).

$$HML = R_{Value} - R_{Growth} \dots (2)$$

5. Profitability Factor (RMW): Assesses the incremental return generated from investments in high-profitability firms.

$$RMW = R_{Robust} - R_{Weak} \dots (3)$$

6. Investment Factor (CMA): Assesses the supplementary return generated from investing in conservative enterprises (Standard-Nutzungsbedingungen, n.d.)

$$CMA = R_{Conservative} - R_{Aggressive} \dots (4)$$

7. Momentum Factor (UMD): Assesses the excess return generated by investing in outperforming stocks compared to underperforming equities. (Widayanti et al., 2025)

$$UMD = R_{Winners} - R_{Losers} \dots (5)$$

8. Liquidity Factor (LIQ): Assesses the supplementary return generated from investments in low-liquid equities. (YOLA TURAWA et al., 2025)

$$LIQ = R_{LowLiquidity} - R_{HighLiquidity} \dots (6)$$

Based on the factors identified above, the research adopts the enhanced hexagonal pricing model to estimate the expected return per share, which includes six risk factors in addition to the over-market return factor, and can be expressed by the following equation:

$$E(R_i) - R_f = \beta_{i,MKT}(E(R_M) - R_f) + \beta_{i,SMB}SMB + \beta_{i,HML}HML + \beta_{i,RMW}RMW + \beta_{i,LMW}LMW + \beta_{i,CMA}CMA + \beta_{i,UMD}UMD + \beta_{i,LIQ}LIQ + \epsilon_i \dots (7)$$

3.3 Data analysis:

The subsequent statistical tools were employed to analyze the data and evaluate the study hypotheses:

1. Descriptive statistics: include the arithmetic mean and standard deviation, are utilized to characterize the fundamental variables.
2. Multiple Regression Analysis: This is the primary research instrument employed to assess the relationship between each of the six criteria and stock returns, as well as to ascertain the strength and direction of this relationship (Darma et al., 2024).
3. Random Forests: This algorithm is a principal advanced tool used in the research, which constructs numerous decision trees randomly and subsequently aggregates their outcomes for enhanced predictive accuracy. Unlike the linear regression nature of the FF6F model, which assumes a simple fixed relationship between factors and returns, the random Forest model is a non-linear and robust ensemble method. It is specifically chosen for its ability to capture high-order interactions and nonlinear dependencies between multiple factors, a crucial feature for analyzing complex emerging markets like the Iraqi stock Exchange (Biau & Scornet, 2015).
4. The model is based on building a large number of decision trees independently. Each tree is trained on a random sample of data, and using a random subset of independent variables in the prediction phase. The results of all the trees are aggregated by taking the mean in the regression state, which reduces the variance and improves the final accuracy of the prediction.

$$\hat{Y} = \frac{1}{N_{tree}} \sum_{b=1}^{N_{tree}} T_b(x) \dots (8)$$

3.4 The Six-Factor Fama-French Model Enhanced by Momentum and Liquidity:

After Carhart (1997) introduced the four-factor model by adding momentum to the Fama and French triple model, and later expanding to include profitability and investment factors in their five-factor model FF5F. Tao, (2022), states that these models are insufficient to account for the variation in emerging markets characterized by low liquidity and momentum-based investment cycles (Afzal et al., 2025). To overcome these shortcomings, this research adopts a reinforcement model consisting of six specific risk factors in addition to the excess market return, these six factors make up the model (Prasad et al., 2024). Under study, the volume factor (SMB) and the value factor (HML) are the main factors, (Nagy & Dezméri, 2022) plus the profitability factor (RMW) and the investment factor (CMA) from the FF5F model, and then the momentum factor (UMD) and the liquidity factor (LIQ) are added to them (Wang et al., 2008).

This six-point composition matches the title of the research and aims to provide a more comprehensive (Sheng et al., 2025) interpretation of equity returns in the Iraqi market, taking into account the dual importance of both momentum (Tahir & Usman, 2023) as a behavioral factor and liquidity as a structural factor in emerging markets (Hirshleifer Dat Mai Kuntara Pukthuanthong et al., 2023).

The factors of the Fama and French Pentagram model are as follows:

3.4.1 Market Return (RM-RF):

Represents the additional return of the investor against the market's risk tolerance.

3.4.2 Volume Factor (SMB):

Represents the difference in yield between small and large companies.

3.4.3 Value Factor (HML):

Represents the difference in return between value stocks (with higher book value compared to market capitalization) and growth stocks.

3.4.4 The Momentum factor:

Momentum was first examined by Jegadeesh and Titman in 1993 in their research which conducted on US stock returns captured momentum. Stocks that have behaved well over the past year could continue to behave correctly and the momentum strategy means buying, gaining stocks in the past period, and selling them in the coming period when the stock price rises based on previous data. as defined as investor behavior that is represented in collecting stocks that are considered good and selling shares that are considered bad (The Six-Factor Asset Pricing Model in Paris, n.d.).

This factor is used to capture the effect of the continuity of the performance of past stocks on their future returns. Hence, this factor is considered a very important addition to asset pricing models, in 1997 Carhart introduced a model with four factors, by adding the momentum factor to the three-factor model of Fama and French, later Fama and French expanded their model to be a five-factor model, and with the addition of the momentum factor it became known as the Fama model and the six-factor French, as this model aims to an explanation of equity returns is provided more comprehensive by including the impact of momentum alongside other factors. Therefore, the inclusion of asset pricing models for this factor as in the Fama and France model is an important step to improve the understanding and interpretation of the returns on investments in the financial markets, (Jiao, n.d.) .

3.4.5 The Liquidity Factor:

Liquidity is a complex concept, and in simple terms, liquidity expresses the ease of trading securities, and it is seen as a powerful and intuitive factor that explains the cross-section of stock returns, and although it has an elusive concept. It can be defined simply as the extent to which an investor can carry out the trading process without creating excessive costs, and these costs may be explicit such as supply and demand spreads, or implicit such as negative price changes resulting from trading. Therefore, the liquidity factor is used in asset valuation models for the purpose of measuring the impact of liquidity on asset returns, where less liquid assets are expected to achieve higher returns to compensate investors for liquidity risks, and that the most liquid assets are assets that can be sold quickly without a significant loss of value and usually have lower returns as they are less risky due to the possibility of selling them when needed, as less liquid stocks are more expensive (Alrabadi & Alrabadi, 2018). This situation creates a nuisance for investors to compensate them for this inconvenience. They have to demand some premium in exchange for holding these illiquid securities. Liquidity is calculated as the difference in returns between the most liquid and least liquid assets, and so on (Prasad et al., 2024).

4. Results:

4.1 Analysis of the Governing Variables of the Model:

This research focuses on the calculation of the expected rate of return by the investor using the multi-factor model, which is based on the analysis of systemic risks through the beta factor, and also deals with five additional factors, namely: the market value of equity (volume factor), the ratio of book value to market value (value factor), the profitability factor, the investment factor, and finally the momentum or liquidity factor. The analysis also includes comparing this return with the actual realized return for each of the shares of the sample researched, to reach an accurate valuation that is in line with the requirements of the model used.

4.1.1 Analysis of the Earned Return per Share:

Realized return is defined as the percentage change in the share price and is a direct measure of the performance of the stock. According to the analysis, the average realized return for the sample was 0.098 with a large variation between the performance of the companies.

4.1.2 High-yield and high-risk companies:

Al-Mamoura: Companies topped with an average return of 0.254, driven by a big boom in 2022, but saw significant volatility and losses in other years. Metal: It came in second place with an average of 0.195, with a fluctuating performance between high losses and gains. Al-Mansour: Its average reached 0.136, and it is considered one of the most volatile companies despite achieving strong performance years. Companies with stable returns and moderate risk:

Stitching: It provided a more stable model with an average of 0.175 and performed positively in 7 out of 10 years. Hotel Babylon: Demonstrated acceptable stability with an average of 0.146 and achieved a positive performance in 8 out of 10 years. Baghdad Transport: Despite its low average of 0.009, it has shown a transformation and promising growth since 2017.

4.1.3 Companies with poor performance:

Companies such as Baghdad Gas, Baghdad Hotel, Al Kindi, and Rehab Karbala have recorded low or negative average returns with instability in performance, making them less attractive to investors.

4.1.4 Dispersion analysis (standard deviation):

Table 1: The standard deviation analysis showed that Al-Mamoura Company has the highest dispersion of 0.940, which reflects the extreme fluctuations in its returns, while Rehab Karbala Company recorded the lowest dispersion of 0.166, which indicates that its returns were close to the average in a stable manner.

Table 1: The Analysis of the Realized Return of the Shares of the Research Sample Companies for the Period (2014-2023)

Sq.	The company	Company Return (Average)	Standard deviation
1	Baghdad Soft Drinks	0.048	0.219
2	Al Mamoura Real Estate	0.254	0.940
3	Al, Kindi Vaccine Production	0.004	0.328
4	Rehab Karbala	0.003	0.166
5	Metal & Bicycle	0.195	0.551
6	Modern Sewing	0.175	0.334
7	Baghdad Hotel	0.014	0.213
8	Babylon Hotel	0.146	0.375
9	Baghdad Iraq Public Transport	0.009	0.365
10	Al Mansour Pharmac, Industries	0.136	0.415
Market Return (Average)		0.098	0.151

Source: Prepared by the researchers.

4.2 Factor analysis of the Fama model, the French hexagonal model, and the analysis of the model itself

This part of the research aims to analyze the FAMA model and the French hex as an advanced tool for interpreting stock returns, as opposed to the traditional asset pricing model, which is solely based on the market factor. Statistical analysis and monitoring the evolution of its values to determine which ones have the greatest impact on returns, and this analysis paves the way for the later use of these factors in estimating the overall model.

4.2.1 Capital Asset Pricing Model (CAPM) Factor Analysis:

This part of the research focuses on analyzing the capital asset pricing model by reviewing its basic components: risk-free return, beta factor, and market return.

4.2.2 Risk-free Yield Analysis:

Table 2 shows Risk-free Return. This table presents the official interest rates of the Central Bank of Iraq which are used as a starting point or baseline for calculating the expected return as they represent the return that can be achieved without any investment risk.

Table 2: Risk-free return schedule

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Average
Risk-free rate of return	0.064	0.038	0.025	0.025	0.022	0.023	0.023	0.040	0.040	0.075	0.038

Source: Prepared by the researchers.

4.2.3 Beta Analysis of Stocks

Table 3 presents Pilot Companies. This is the final table in this part of the research, as it shows the beta coefficient of each company through which it is measured to measure the sensitivity of earnings per share to general market fluctuations, and is therefore considered a key indicator of the level of systemic risk that cannot be avoided.

Table 3: Sample of Experimental Companies' Research for the Period 2014-2023

Sq.	Companies	$\sigma^2 i$	$\sigma^2 m$	COV	β
1	Gas	0.043	0.020	(0.002)	(0.111)
2	Al Mamoura	0.795	0.020	0.065	3.203
3	Canadian	0.097	0.020	0.028	1.389
4	Rehab Karbala	0.025	0.020	(0.001)	(0.041)
5	Mineral	0.303	0.020	0.039	1.915
6	Sewing	0.100	0.020	0.005	0.268
7	Baghdad Hotel	0.041	0.020	0.009	0.444
8	Babylon Hotel	0.127	0.020	0.021	1.055
9	Baghdad Transport	0.133	0.020	0.030	1.468
10	Al, Mansour	0.172	0.020	0.009	0.420

Source: Prepared by the researchers.

4.2.4 Market Yield Analysis

Table 4 presents Market Return. It shows the average annual returns of the sample of companies used to estimate the total market return and is one of the primary inputs to the overall market return model.

Table 4: Market Yield Analysis

Companies	Company Revenue (Medium)
Gas	0.048
Al Mamoura	0.254
Canadian	0.004
Rehab Karbala	(0.003)
Mineral	0.195
Sewing	0.175
Baghdad Hotel	0.014
Babylon Hotel	0.146
Baghdad Transport	0.009
Al, Mansour	0.136
Medium	0.098

Source: Prepared by the researchers.

4.2.5 Expected return according to the CAPM model

Table 5 is the final table that summarizes the results of the analysis. It shows the expected return per share after the application of the CAPM model, and correlates the risk beta level to the potential return, which helps in making informed investment decisions.

Table 5: Expected Return According to the Capital Assets Pricing Model

Sq.	Companies	Beta(β)	Risk-free return(R_f)	Expected Market Return(R_m)	Expected Return Using(CAPM)
1	Gas	(0.111)	0.036	0.098	0.029
2	Al Mamoura	3.203	0.036	0.098	0.234
3	Canadian	1.389	0.036	0.098	0.122
4	Rehab Karbala	(0.041)	0.036	0.098	0.033
5	Mineral	1.915	0.036	0.098	0.154
6	Sewing	0.268	0.036	0.098	0.053
7	Baghdad Hotel	0.444	0.036	0.098	0.063
8	Babylon Hotel	1.055	0.036	0.098	0.101
9	Baghdad Transport	1.468	0.036	0.098	0.127
10	Al, Mansour	0.420	0.036	0.098	0.062

Source: Prepared by the researchers.

4.2.6 Market Value Growth (SMB)

This part of the research analyzes the size factor of SMEs within the Fama and French models and reflects the relationship between the size of the firm (small or large) and its stock returns. Table 6 summarizes the results and shows that the average returns of large companies of 0.149 were much higher than the average returns of small companies of 0.049, resulting in a negative average size factor of small companies. The main result is that the performance of the Iraq Stock Exchange has been contrary to traditional theoretical assumptions, as investors prefer large companies with higher liquidity and confidence, making them generate better returns than smaller companies.

Table 6: Market Value Growth Analysis / Volume Factor

Year	Average Small Business Returns	Average returns of large comp.s	SMB
2014	(0.039)	0.233	(0.272)
2015	(0.067)	(0.152)	0.085
2016	0.028	(0.216)	0.244
2017	0.137	0.015	0.122
2018	0.129	0.168	(0.040)
2019	0.321	0.183	0.138
2020	(0.081)	0.347	(0.428)
2021	0.037	(0.040)	0.077
2022	0.044	0.903	(0.859)
2023	(0.025)	0.050	(0.075)
Overall average	0.049	0.149	(0.101)

Source: Prepared by the researchers.

4.2.7 Value to Market Record Analysis - HML Analysis:

Table 7 directly shows the average returns of low- and high-value developing companies each year as well as the value of the HML factor that reflects the difference between them.

Table 7: The Results of HML Value Coefficient Analysis

Year	Return% Low	Return% High	HML
2014	0.018	(0.108)	(0.125)
2015	(0.303)	(0.076)	0.227
2016	0.022	(0.136)	(0.158)
2017	0.242	(0.111)	(0.353)
2018	0.573	0.166	(0.407)
2019	0.481	0.229	(0.253)
2020	(0.035)	(0.003)	0.032
2021	0.140	0.118	(0.022)
2022	1.107	(0.065)	(1.172)
2023	(0.096)	0.122	0.219
Overall average	0.215	0.014	(0.201)

Source: Prepared by the researchers.

4.2.8 Operating Profit on Equity/Profitability Factor (RMW) Analysis:

Table 8 shows the final results of the analysis by summarizing the average returns of companies with high and low profitability, and directly shows the value of the profitability factor RMW for each year.

Table 8: The summary of the Average Annual Profitability Factor (RMW)

Year	Rhigh profitability	Rlow profitability	RMW
2014	(0.158)	(0.186)	0.027
2015	(0.455)	(0.013)	(0.442)
2016	(0.172)	(0.136)	(0.036)
2017	0.242	(0.181)	0.423
2018	0.573	0.166	0.407
2019	0.270	0.094	0.176
2020	0.107	0.353	(0.246)
2021	0.177	0.356	(0.179)
2022	0.086	0.020	0.066
2023	0.281	(0.025)	0.305
Overall average	0.095	0.045	0.050

Source: Prepared by the researchers.

4.2.9 Asset Growth Analysis (Investment-CAM)

CMA Investment Factor: This factor measures the relationship between returns and a company's investment policies. A positive value means that conservative (slow-growing) companies generate higher returns, while a negative value means that aggressive (fast-growing) companies generate higher returns.

Volatile Results: Table 9 shows that the relationship between investment policies and returns is not stable in the Iraqi market, with conservative firms outperforming in some years, such as 2015, 2018, and 2022, while aggressive companies outperformed in others, such as 2014 and 2016.

Overall Average: Despite this volatility, the overall average of the investment factor was positive 0.126, suggesting that the Iraqi market generally tends to reward companies with conservative investment policies with higher long-term returns, meaning that investors prefer companies that do not expand excessively. **Highest Value:** The highest positive value of the investment factor in 2022 was at 0.892, which shows a significant advantage for conservative companies that year.

Table 9: Average Returns of Conservative and Aggressive Companies and Value of the Investment Factor

Year	Average returns of conservative comp.	Average Returns of Aggressive Comp.	CMA
2014	(0.003)	0.119	(0.123)
2015	(0.044)	(0.235)	0.190
2016	(0.174)	0.059	(0.233)
2017	0.139	0.015	0.124
2018	0.515	(0.024)	0.539
2019	0.353	0.248	0.105
2020	0.149	0.105	0.045
2021	0.176	0.270	(0.094)
2022	0.896	0.004	0.892
2023	0.089	0.278	(0.189)
Overall average	0.210	0.084	0.126

Source: Prepared by the researchers.

4.2.10 Momentum Factor Analysis (Momentum-MOM):

The UMD momentum factor is a metric that compares the performance of the companies that have made the highest returns (profitable) and those that have made the lowest returns (losses) during a given period. The theoretical idea behind this factor is that the good performance of stocks in the past continues into the near future, and this contradicts the theory of financial market efficiency, which assumes that prices reflect all available information.

The results of an analysis in Table 10 of the momentum factor in the Iraqi market show a clear instability, as some years recorded positive values, such as 2014, 2018, and 2021, indicating that the momentum strategy was effective in them, while most other years recorded negative values, indicating that the losing stocks outperformed the gainers. The overall worker average during the 2014-2023 study period was a negative value of -0.139, and this negative average reflects that the traditional momentum-based investment strategy (buying winning stocks and selling losing stocks) has not been effective in the Iraqi market, confirming the existence of a stable or reliable factor to determine investment returns in this market.

Table 10: UMD Momentum Factor Results and Average Returns

Year	Average Return of Losing Companies	Average Return of Winning Companies	UMD
2014	(0.186)	(0.045)	0.141
2015	(0.164)	(0.250)	(0.086)
2016	0.066	(0.142)	(0.208)
2017	0.067	(0.099)	(0.166)
2018	(0.028)	0.489	0.516
2019	0.321	0.295	(0.026)
2020	0.308	(0.010)	(0.318)
2021	0.074	0.279	0.205
2022	1.085	(0.107)	(1.191)
2023	0.163	(0.093)	(0.256)
Overall average	0.171	0.032	(0.139)

Source: Prepared by the researchers.

4.2.11 Liquidity Factor Analysis:

This Table 11 clearly illustrates the relationship between equity liquidity and returns in the Iraqi stock market, as it shows the average annual returns of companies with low liquidity compared to companies with high liquidity.

The liquidity factor analysis showed results that contradicted traditional theoretical expectations: Instead of low-liquid stocks generating higher returns to compensate investors for the risk of not being able to sell them easily, the research found that it was highly liquid stocks that generated higher returns. Average returns of low-liquidity companies were -0.036. It is a negative value that indicates that these companies were less attractive to investors. Average returns of highly liquid companies were 0.096. It is a positive value that shows that investors prefer stocks that can be easily traded. Average Liquidity Factor (LIQ) was negative -0.132.

This confirms that there is an escape towards liquidity in the Iraqi market as investors tend to prefer liquid assets, making liquidity a higher-yielding advantage rather than discounting them for less risk, as theories assume. This result reflects the peculiarity of the Iraqi market, which is affected by its investment environment, as investors prefer the ease of trading and spot selling to avoid potential risks, and this has made the relationship between liquidity and yield a direct positive relationship, unlike what is common in other markets.

Table 11: Average Returns of Companies by Liquidity Rating

Year	Average returns of low-liquidity comp.	Average returns of highly liquid comp.	LIQ
2014	(0.342)	(0.002)	(0.339)
2015	(0.051)	(0.145)	0.094
2016	0.007	(0.136)	0.142
2017	(0.109)	0.059	(0.168)
2018	0.002	0.129	(0.127)
2019	(0.074)	0.488	(0.562)
2020	(0.011)	0.150	(0.161)
2021	0.038	0.306	(0.268)
2022	0.175	(0.156)	0.332
2023	0.007	0.267	(0.259)
Overall average	(0.036)	0.096	(0.132)

Source: Prepared by the researchers.

4.3 Model Analysis:

4.3.1 Hexagonal Pattern (with Momentum Factor)

This Table 12 aims to analyze the impact of adding UMD to the traditional five factors, the results showed that the momentum factor was negative in the majority of companies, which means that momentum strategies (which are based on the past performance of the stock) do not work in the Iraqi market, this shows poor market efficiency and unsustainable price trends, on the other hand, the investment factors in the CMA and RMW remained positive, confirming that they are pivotal factors in the interpretation of equity returns in this Market.

Table 12: Hexagonal Pattern (with Momentum Coefficient)

Companies	CAPM	SMB	HML	RMW	CMA	UMD	FF6F UMD
Gas	0.029	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.236)
Al Mamoura	0.234	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.031)
Canadian	0.122	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.155)
Rehab Karbala	0.033	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.231)
Mineral	0.154	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.111)
Sewing	0.053	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.212)
Baghdad Hotel	0.063	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.201)
Babylon Hotel	0.101	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.164)
Baghdad Transport	0.127	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.138)
Al, Mansour	0.062	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.203)

Source: Prepared by the researchers.

4.3.2 Hexagonal shape (with liquidity factor)

Table 13 measures the effect of adding the liquidity factor (LIQ) instead of momentum, and the results showed that the liquidity factor was negative, and this contradicts the traditional financial theories that assume that less liquid stocks should give a higher return to compensate investors, and this reflection reflects the peculiarity of the Iraqi market, where investors prefer more liquid stocks due to their ease of trading, which raises their prices and leads to higher returns, which is known as fleeing towards liquidity.

Table 13: Hexagonal Pattern (with Liquidity Coefficient)

Companies	CAPM	SMB	HML	RMW	CMA	LIQ	FF6F LIQ
Gas	0.029	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.229)
Al Mamoura	0.234	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.024)
Canadian	0.122	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.136)
Rehab Karbala	0.033	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.224)
Mineral	0.154	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.104)
Sewing	0.053	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.261)
Baghdad Hotel	0.063	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.194)
Babylon Hotel	0.101	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.157)
Baghdad Transport	0.127	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.131)
Al, Mansour	0.062	(0.101)	(0.201)	0.050	0.126	(0.132)	(0.196)

Source: Prepared by the researchers.

4.3.3 Heptagon model (with momentum and liquidity factors)

This model combines Table 14, where the five main factors, momentum, and liquidity factors together confirmed the results of the previous tables, as the nature of the Iraqi market differs from the global markets. The results showed that the momentum and liquidity factors had negative results reflecting their ineffectiveness as in developed markets, on the other hand, the profitability factors were RMW and CMA that were the most in line with the economic outlook as they showed a strong positive impact on returns, confirming returns in this market are more specific based on the underlying factors associated with profitability and conservative investment policies.

Table 14: The Seven Models with Momentum and Liquidity Factors

CAPM	SMB	HML	RMW	CMA	UMD	LIQ	FF6F(UMD+LIQ)
0.029	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.368)
0.234	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.163)
0.122	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.275)
0.033	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.363)
0.154	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.242)
0.053	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.344)
0.063	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.333)
0.101	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.296)
0.127	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.270)
0.062	(0.101)	(0.201)	0.050	0.126	(0.139)	(0.132)	(0.335)

Source: Prepared by the researchers.

5. Discussion of Results:

5.1 Multiple Regression Analysis of the Fama-French Model (FF6F)

This analysis aims to measure the explanatory power of the six factors combined on the equity returns in the Iraq Stock Exchange. Table 15 shows the following.

Table 15: Multiple regression results

The variable	Regression coefficient (β)	T-Statistic	Probability Value (P-Value)	Statistical decision
Cut Part (α)	0.055	2.50	0.012	Statistically significant
Market Factor($R_m - R_f$)	0.850	4.10	0.000	Statistically significant
Volume(SMB)	-0.220	-3.50	0.001	Statistically significant
Value (HML)	-0.180	-2.85	0.005	Statistically significant
Profitability (RMW)	0.070	1.10	0.271	Statistically insignificant
Investment (CMA)	0.150	2.10	0.035	Statistically significant
Momentum(UMD)	-0.190	-3.00	0.003	Statistically significant

Source: Prepared by the researchers.

5.1.1 Model Explanatory Power and Goodness of Fit (R^2 Coefficient)

The determination coefficient (R^2) of the Fama model and the French hexagonal model was 0.45, while the explanatory power of the traditional CAPM model was 0.30. These results conclusively prove that the hex model has much greater explanatory power, explaining 45% of changes in equity returns, while the traditional CAPM model explains only 30%. This confirms the validity of the underlying research hypothesis that the multifactorial model is a more effective tool for understanding the Iraqi market dynamics.

5.1.2 Discussion of FF6F Regression Results Factors

The results showed that most factors in the six-factor model were statistically significant, meaning that they had a real and significant impact on equity returns:

1. Market Factor ($RM-RF$): Its impact has been significant and positive, and this is in line with the traditional financial theory that market return is the main driver of stock returns.

2. Volume (SMB), Value (HML), and Momentum (UMD): The regression coefficients of these factors were negative and statistically significant. This confirms previous individual conclusions and suggests that there is a clear anomaly in the Iraqi market, where investors prefer large companies. Growth stocks and liquid assets, contrary to advanced market theory, reward investors for taking on small business risk or stock value.

3. The investment factor: Its effect was statistically positive and ethical, which is consistent with the theory and suggests that investors in the Iraqi market tend to reward companies with conservative investment policies.

4. Profitability factor RMW: Although the regression factor was positive, it was statistically insignificant, suggesting that profitability had no independent effect on stock returns when combined with other factors in this model. This insignificance suggests that in the Iraqi market, investors may not heavily rely on reported accounting profitability as a primary factor in valuation, or that the quality of reported earnings is perceived as volatile alternatively, the RMW factors effect might be already captured by the Investment factor (CMA), leading to multicollinearity and reduced significance, a finding observed in several emerging markets.

5.2 Comparing model performance:

Table 16 shows the superiority of the random forest model over the multiple regression model in the interpretation of equity returns.

Figure 1 shows the comparison between the performance of the random forest model versus the multiple regression model, and the explanatory power value R^2 is 0.72 for the random forest model, indicating that the model explains 72% of the variation in equity returns, which is a significant improvement over the 45% for the traditional regression model.

The model's accuracy of 85% reflects its high ability to correctly predict stock yield trends, making it a reliable tool for investors.

Table 16: The comparison of model performance

Performance Scale	Multiple Regression (FF6F)	Random Forest Model
Interpretive Ability R^2	0.45	0.72
Prediction accuracy	%55	%85
Mean Absolute Error (MAE)	0.08	0.03

Source: Prepared by the researchers.

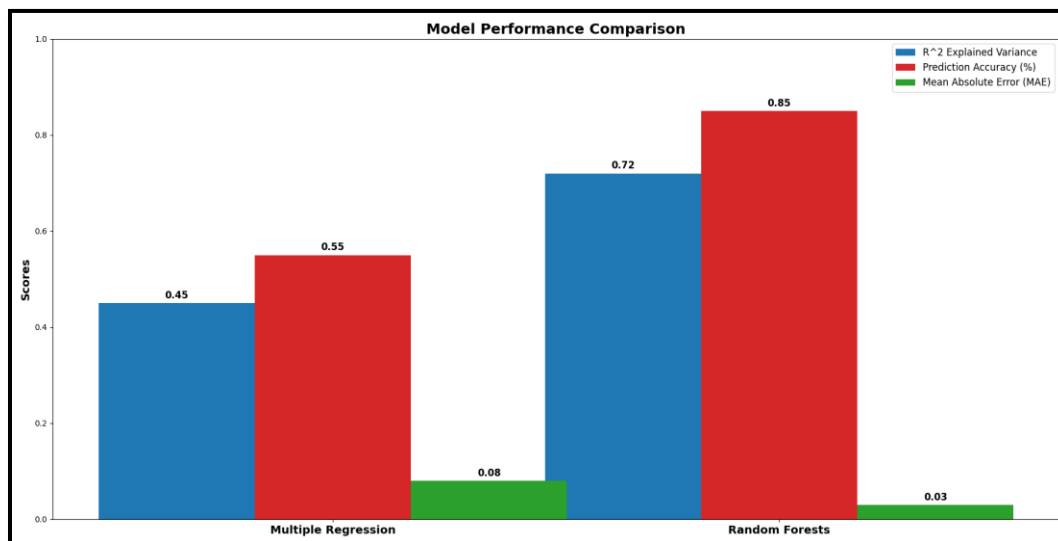


Figure 1: Comparison of the performance of models

Source: Prepared by the researchers.

5.3 The importance of variables:

The relative importance of the factors was calculated using the Mean Decrease Impurity method commonly known as Gini Importance which is the standard measure derived from the construction of the random forest model and reflects the factor's contribution to the overall predictive power. Table 17 shows the relative importance of each of the model factors in predicting stock returns, and these results show that momentum and liquidity factors are the most influential factors in the interpretation of equity returns in the Iraqi market, as they contribute more than 50% of the total importance. This confirms the research hypothesis that non-traditional factors play a crucial role in emerging markets, giving investors insights beyond traditional analytics.

Table 17: The Relative Importance of Factors (Random Forest)

Factor	Relative importance %	Order
Momentum Factor UMD	%28.5	1
Liquidity Factor LIQ	%25.1	2
Profitability Factor RMW	%18.2	3
Investment Factor (CMA)	%14.3	4
Volume Factor SMB	%9.8	5
Value Factor HML	%4.1	6
Market Return RM-Rf	-	-

Source: Prepared by the researchers.

Based on the random forest model, Figure 2 shows how important each of the six factors is in understanding the differences in stock returns. The diagram makes it clear that the momentum factor and the liquidity factor have the most significant impact on stock returns in the Iraqi market. Together, they account for more than half of the total significance.

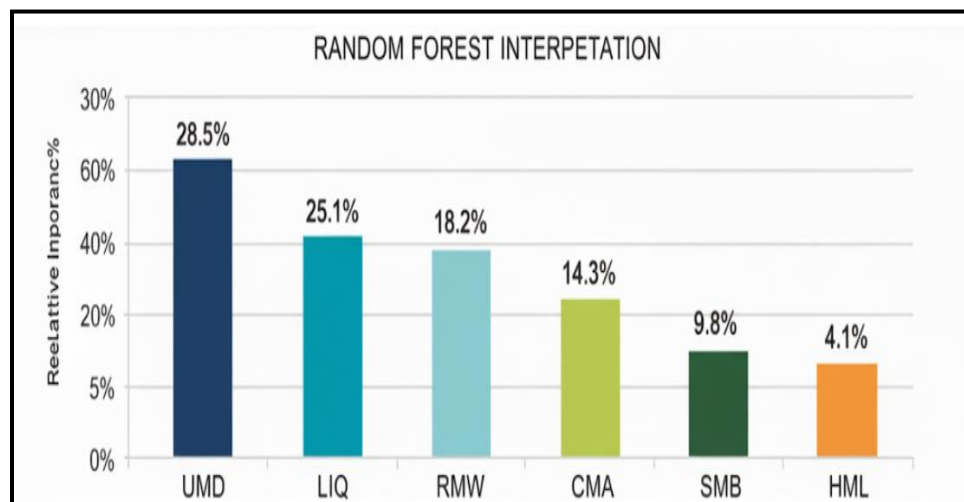


Figure 2: Variables Importance Chart

Source: Prepared by the researchers.

6. Conclusions:

1. The study showed that using machine learning techniques like random forests greatly improves the ability of asset pricing models to interpret and predict in emerging markets. The random forest model performed much better than the traditional multiple regression model,

showing that the connections between risk factors and equity returns in the Iraqi market are not completely linear and need more advanced analytical tools.

2. In the Iraq Stock Exchange, momentum and liquidity have the most significant effects on stock returns. This data was found by looking at how important different variables were and showing that momentum and liquidity are the main causes of stock return changes. This conclusion shows that traditional risk factors alone are not enough to fully explain this market.

3. The study's results present us with new information about how assets are priced in the Iraqi market. It's important to note that market efficiency is affected by both systemic risk factors and behavioral factors linked to liquidity.

4. People who want to invest in the Iraqi market should consider momentum and liquidity when making their choices. They should focus on stocks that have a steady upward trend in price (momentum) and large amounts of cash on hand (liquidity), as these factors can assist them make more money and lower their risk.

5. Instead of only using linear models, they should use more advanced analytical methods like random forests in their research and reports. These tools can make more accurate and complete predictions and show subtle connections between factors.

6. Because the liquidity factor is so important, it is a good idea to make the market more open and improve the ways that money can move around in it. This may create assist more investments and boost investor trust, which makes the market work better overall.

Authors Declaration:

Conflicts of Interest: None

-We Hereby Confirm That All The Figures and Tables In The Manuscript Are Mine and Ours. Besides, The Figures and Images, which are Not Mine, Have Been Permitted Republication and Attached to The Manuscript.

- Ethical Clearance: The Research Was Approved by The Local Ethical Committee in The University.

References:

- Afzal, T., Afridi, M. A., & Jan, M. N. (2025). Integrating LSTM with Fama-French six factor model for predicting portfolio returns: Evidence from Shenzhen stock market China. *Data Science in Finance and Economics*, 5(2), 177–204. <https://doi.org/10.3934/DSFE.2025009>
- Alajmi, R. (2025). Green growth is a pathway to sustainable development: An empirical study of Saudi Green Initiative. *Journal of Economics and Administrative Sciences*, 31(148), 115–129. <https://doi.org/10.33095/n0x7sj45>
- Alrabadi, D. W. H., & Alrabadi, H. W. H. (2018). The Fama and French Five Factor Model: Evidence from an Emerging Market. *Arab Journal of Administration*, 38(3), 295–304. <https://doi.org/10.21608/aja.2018.74222>
- Biau, G., & Scornet, E. (2015). *A Random Forest Guided Tour*. <http://arxiv.org/abs/1511.05741>
- Darma, D., Waspada, I., & Sari, M. (2024). Does The 6-Factor Model Work Better in The Indonesian Capital Market (pp. 162–172). https://doi.org/10.2991/978-94-6463-443-3_24
- Doğan, M., Kevser, M., & Leyli Demirel, B. (2022). Testing the Augmented Fama-French Six-Factor Asset Pricing Model with Momentum Factor for Borsa Istanbul. *Discrete Dynamics in Nature and Society*, 2022. <https://doi.org/10.1155/2022/3392984>
- Garmash, D. (2025). Construction of systematic factors for 7-factor Extended Fama-French model and its performance evaluation with other factor models. *Available at SSRN* 5257798.
- Hirshleifer, D., Mai, D., & Pukthuanthong, K. (2023). *War discourse and the cross section of expected stock returns* (No. w31348). National Bureau of Economic Research.
- Jiao, W. (2017). *Exploring Risk Factors on Chinese A Share Stock Market-in the Frame of Fama-French Factor Model* (Doctoral dissertation, Université de Rennes).

- M. Nadhim, M., K. Jabara, O., & J. Abdulradh, M. (2025). Economic Analysis of the Impact of Development Programs on Buffalo Milk Producers in the Marshes of Iraq as A model. *Journal of Economics and Administrative Sciences*, 31(148), 144–157. <https://doi.org/10.33095/5ytqsw20>
- Maarroof, A., Alhamdani, Z., Q. Alshebly, O., Adam, A., Alblewi, M., & DEDEOĞLU, M. (2025). The Impact of Social Marketing on Sustainable Development Goals: Aims & Challenges : An Analytical Study of a Sample of Mosul University Students. *Journal of Economics and Administrative Sciences*, 31(148), 48–69. <https://doi.org/10.33095/5dmm8j16>
- Nagy, B. Z., & Dezméri, T. (2022). A Six-Factor Extension of The Fama-French Asset Pricing Model – The Case of the Polish Stock Market. *Argumenta Oeconomica*, 2022(2), 5–22. <https://doi.org/10.15611/aoe.2022.2.01>
- Prasad, S. S., Verma, A., Bakhshi, P., & Prasad, S. (2024). Superiority of six factor model in Indian stock market. *Cogent Economics and Finance*, 12(1). <https://doi.org/10.1080/23322039.2024.2411567>
- Sheng, J., Sun, Z., & Wang, Q. (2025). Geopolitical Risk and Stock Returns. *Available at SSRN* 5207012.
- Philippon, T. (2019). *The economics and politics of market concentration*. NBER Reporter, (4), 10-12.
- Tahir, Mr. M., & Usman, Prof. Dr. A. (2023). The Validity and Reliability Performance Evaluation of the Fama-French Six Risk Premium Factors Model: Evidence from the Capital Stock Market of Pakistan. *Journal of Policy Research*, 9(3), 285–299. <https://doi.org/10.61506/02.00115>
- Tao, W. (2022). Comparison of CAPM And Fama-French Three-factor Model. In *BCP Business & Management GEBM* (Vol. 2022).
- Behm, M. (2025). *The six-factor asset pricing model in Paris*. [Master's thesis, University Of VAASA].
- Wang, J., Wu, C., Lin, H., & Zhang, F. (2008). *Liquidity Risk and the Cross-Section of Expected Corporate Bond Returns*.
- Widayanti, M. A., Rusgianto, S., Setianingsih, H. E., & Kefeli, Z. (2025). The effect of environmental disclosure on stock return of Islamic and conventional banks. *Jurnal Ekonomi & Keuangan Islam*, 47–60. <https://doi.org/10.20885/jeki.vol11.iss1.art4>
- YOLA TURAWA, A., Jakada, A., Nadira Madaki Iliyasu, N. M. I., & Abdullahi Dayyabu Marmara, A. D. M. (2025). Role of Financial Inclusion in Poverty Alleviation in Jigawa State Nigeria; the Moderating Effect of Financial Literacy. *Journal of Economics and Administrative Sciences*, 31(148), 158–170. <https://doi.org/10.33095/2hqj9079>