THE PORTFOLIO MANAGEMENT: INVESTIGATION OF THE FAMA-FRENCH FIVE- AND SIX-FACTOR ASSET PRICING MODELS

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Abstract: The novel contribution of this paper is to test if the Fama-French five- and six-factor models can explain the portfolio returns in the Regional Stock Exchange of Ivory Coast Securities (BRVM) between January 2007 and December 2018. For the Fama-French five-factor model, the results show that the only useful factors for describing the portfolio excess return are the market, value and profitability when the OLS and the GARCH techniques are used. For the augmented Fama French six-factor model, the results report that only the market, value, profitability and illiquidity factors played an eminent role in explaining the portfolio excess return. Moreover, using the OLS technique, it is found that the Fama-French five-factor model and the augmented Fama-French six-factor model can capture the portfolio returns. However, when the GARCH technique is used, the findings show that these models can fully explain the portfolio returns. The results found can help portfolio managers to identify extensive factors that have an impact on the equity returns and to estimate the required return on the stock. Moreover, traders can employ these factor models to control investment risk.

Keywords: Fama-French five-factor model; augmented Fama-French six-factor model; risk factors; OLS, GARCH.

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Introduction

For many years since the apparition of the capital asset pricing model (CAPM) suggested by these three authors Sharpe (1964), Lintner (1965) and Black (1972), the factor models have been the principal models in the stock pricing area. They generally rely on the employment of the factor investigation to recognize the factors that have an impact on the stock returns. The well-known CAPM is considered as the unique-index factor model. It tried to determine the required stock returns according to the principal hypothesis of the portfolio theory of Markowitz. It possesses the advantages of being not difficult to implement and commentate; nevertheless, it is disapproved by several researchers for its unrealistic hypothesis and inability to explain the anomalies observed in the financial markets. Many researchers have dedicated themselves to create a model

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that beats the shortcomings of the CAPM. They contend that the stock return is determined by other factors besides the excess market returns. The stock pricing models that possess many factors are named multifactor models. The arbitrage pricing theory (APT), proposed by Ross (1976) is one of the multifactor models. In this model, most of the hypotheses underlying the CAPM became more flexible. The APT presumes that the derivation of the stock returns from their expected values may be explained by (n) factors. However, for this model the size of the number (n) and the factors are not designated. In 1993, Fama and French (FF) proposed the three-factor model. In addition to the market beta of the CAPM, the authors introduce the size and book-to-market factors of their Fama-French three-factor model (FF3F model). In the US market, they found that the FF3F model succeeds in explaining most of the variation of cross-sectional excess stock returns.
Since the introduction of the FF3F model, many studies have focused on discovering new factors or examining how the FF3F model behaves on various exchanges around the world. Not long ago, Fama and French (2015) proposed the five-factor model. They added the profitability and investment components to the market, size and book-to-market components returns. They found that the FF5F succeeds in capturing the average excess returns in the US market. In the literature, several factors in addition to the five factors of Fama and French (2015) have been suggested. Among the most eminent factors, the illiquidity factor can be cited. Many authors (Amihud and Mendelson, 1986; Cao and Petrasek, 2014; Galloppo et al., 2015; Dvorský et al., 2019; Harris and Amato, 2019; Gunardi et al., 2020) found that illiquidity has a positive and considerable impact on the expected equity return. Mckane and Britten (2018) reported that the liquidity augmented capital asset pricing model performed better than the FF3F model (1993). Racicot and Rentz (2017) also proposed the liquidity augmented FF5F model to explain the average stock returns.
The study of the applicability of the Fama-French five- and six-factor models interests practitioners in the stock markets. More specifically, a trustworthy factor model is an important tool to help market participants to identify extensive factors that impact the equity returns, estimate the required return on the stock and control investment risk. Moreover, to the best of researchers' knowledge, there is no published work in the context of the BRVM that investigates the applicability of the FF5F model, and the augmented Fama French six-factor model that involves the liquidity factor. Then, the main objective of this current investigation is to examine the performance of the FF5F model and the augmented Fama French six-factor model to explain the average returns in the BRVM.

Literature review

In 2015, Fama and French proposed their FF5F model. In addition to the market beta of the CAPM, the size and the book to market factors, Fama and French (2015) introduced the profitability and investment factors. Using the daily US data from July 1963 to December 2013, Fama and French (2015) reported that the FF5F model performs better than the FF3F model for explaining the average stock returns. They also concluded that the value factor becomes redundant to explain the average stock returns when the profitability and investment factors are added. Using the monthly data for the Australian equity market from January 1982 to December 2013, Chiah et al. (2016) found that the FF5F model performed better than the FF3F model. However, they reported that the FF5F model cannot fully explain the variation in expected stock returns. Employing the monthly data for the Australian equity market between 1990 and 2013, Huynh (2018) found strong profitability and investment patterns in mean stock returns. However, they reported that the FF5F model cannot fully explain the mean stock returns (The magnitude of diminution in alpha is low). In the Chinese context, Lin (2017) reported that only the value and profitability variables played an important role in explaining the average returns of stocks between 1997 and 2015. The only two significant factors are the value and the profitability factors in the FF5F model. Guo et al. (2017) applied the FF5F model in the Chinese stock market between July 1995 and December 2013; they found that size, value and profitability are helpful for describing the average stock returns but the investment factor is not statistically significant. Acaravci and Karaomer (2017) examine the performance of the FF5F model in pricing Turkish stock from July 2005 to June 2016. Using the monthly data, they found that this model can explain the variations in excess portfolio returns. In the Johannesburg stock exchange, Cox and Britten (2019) examined the effectiveness of the FF5F model in explaining returns. They found that this model can explain the stock returns. They also documented that additional profitability and investment factors played an important role in explaining the stock returns. Applying the weekly data for some emerging equity markets from January 2010 through December 2015, Mosoeu and Kodongo (2020) found that the profitability factor is the most important for describing average returns. Using the monthly data for the Indian equity market from July 2000 to June 2015, Tripathi and Singh (2021) found that the FF5F model explains the variation in stock returns better than the CAPM.

The relationship between the equity return and equity illiquidity is first examined by Amihud and Mendelson (1986). They found a significant and positive relationship between the stock returns of the NYSE/ AMEX stocks and the stock illiquidity between 1961 and 1980. Brennan and Subrahmanyam (1996) examined the relationship between the equity returns and the measures of market illiquidity. Employing the center for research in security prices data from 1984 to 1992, they reported a significant and positive relationship between the equity returns and the measures of market illiquidity used in their study. Amihud (2002) found that expected equity returns are a rising function of expected illiquidity in the New York stock exchange from 1964 to 1997. In other words, illiquidity positively and considerably impacts the expected equity return. Cao and Petrasek (2014) documented a significant and positive relationship between the returns of the NYSE/Amex and Nasdaq stocks and the stock illiquidity from 1993 to 2011.

Applying the Fama French dataset and the generalized method of momentum, Racicot and Rentz (2017) found that the only important factor in the augmented Fama French six-factor model that involves the liquidity factor is the market factor. In the American context, Harris and Amato (2019) duplicated and developed the work of Amihud (2002). Employing the current version of the center for research in the security prices dataset, they found the same findings that Amihud (2002) displayed. In other words, illiquidity positively and considerably impacts the expected equity return. Amihud et al. (2015) investigated the illiquidity premium in forty-five equity markets. Using monthly data from 1990 to 2011, they reported that the mean illiquidity return premium in equity markets is significant and positive, after considering other pricing determinants. In the Johannesburg stock exchange, Mckane and Britten (2018) found evidence of a considerable liquidity phenomenon and that this phenomenon has no interaction with the size phenomenon between 2000 and 2015. Moreover, they reported that the liquidity-augmented capital asset pricing model proposed by Liu (2006) performed better than the FF3F model for explaining the cross-section of stock returns.

The majority of previous studies have shown that the FF5F model can fully explain the mean stock returns. They also reported that the illiquidity factor has a considerable impact on the stocks returns. Emulating prior studies, the following hypotheses are formulated.

H_1: the FF5F model can fully explain the portfolio returns.

H_2: the FF5F model with illiquidity factor can fully explain the portfolio returns.

Data and definition of risk factors

In this research, equity market and accounting data of thirty-four companies traded on the BRVM and have full data from January 2007 to December 2018 are used. Equity market data were collected from the web page of the BRVM and the accounting data were obtained from the financial statements of thirty-four companies. Symbols and measures of the risk factors used in this study are presented in Table 1.

Table 1. List of anomaly variables

Risk factors	Symbols	Measures	Authors
Market Risk	Beta	Systematic risk	Sharpe (1964)
Size	Size	Market capitalization	Banz (1981)
Value	B/M	Book-to-market equity ratio	Rosenberg et al. (1985)
Profitability	ROE	Return on equity ratio	Haugen and Baker (1996)
Investment	I/A	Investment-to-assets ratio	Lyandres et al. (2008)
Illiquidity	R/V	Absolute stock returns per dollar of the trading volume	Amihud (2002)

Methodologies

FF5F model

Fama and French (2015) proposed their FF5F model for explaining the average stock returns. This model can be presented as follows:

$$R_{P,t} - R_{f,t} = \alpha_P + \beta_P\left(R_{m,t} - R_{f,t}\right) + s_P SMB_t + h_P HML_t + r_P RMW_t + c_p CMA_t + \varepsilon_t$$

Where,

$R_{P,t} - R_{f,t}$: represents the portfolio return above the risk-free rate on month t.

$R_{m,t} - R_{f,t}$: corresponds to the market portfolio return above the risk-free rate on month t.

SMB_t (Small Minus Big): represents the return on the portfolio of small equities minus the return on the portfolio of big equities on month t.

HML_t (High Minus Low): corresponds to the return on the portfolio of equities possessing high book to market minus the return on the portfolio of equities possessing low book to market on month t.

RMW_t (Robust Minus Weak): is the return on the portfolio of equities with high operating profitability minus the return on the portfolio of equities with low profitability on month t.

CMA_t (Conservative Minus Aggressive): represents the return on the portfolio of low investment companies minus the return on the portfolio of high investment companies on month t.

α_P, β_P, s_P, h_P, r_P and c_p: are the coefficients to estimate and ε_t is an error term.

β_P, s_P, h_P, r_P and c_p: indicate the sensitivity of portfolio P to the five risk factors.

- *If the risk factor has a considerable impact on the excess portfolio returns, the estimated coefficient must be statistically significant.*

α_P: represents the excess portfolio returns, adjusted for the five risk factors.

- *If the FF5F model can fully explain the portfolio returns, the coefficient α_P must be statistically insignificant.*

FF5F model with illiquidity factor

Racicot and Rentz (2017) proposed the liquidity augmented FF5F model to explain the average stock returns. This model can be presented as follows:

$$R_{P,t} - R_{f,t} = \alpha_P + \beta_P\left(R_{m,t} - R_{f,t}\right) + s_P SMB_t + h_P HML_t + r_P RMW_t + c_p CMA_t + i_p IML_t + \varepsilon_t$$

Where,

IML_t: corresponds to the return on the portfolio of illiquid equities minus the return on the portfolio of very liquid equities on month t.

i_p: indicates the sensitivity of portfolio P to the illiquidity factor.

-If the illiquidity factor has a considerable impact on the excess portfolio returns, the estimated coefficient (i_p) must be statistically significant.

α_P: represents the excess portfolio returns, adjusted for the six risk factors.
-If the FF5F model with illiquidity factor can fully explain the portfolio returns, the coefficient α_P must be statistically insignificant.

Construction of the portfolios and risk premiums

The securities are separately sorted each month according to five dimensions: size, value, profitability, investment and illiquidity.

- *Size:* after classifying the market capitalization in ascending order, the securities are divided into two groups (50%) Small (S) and (50%) Big (B).
- *Value:* after classifying the book to market ratio in ascending order, the securities are divided into three groups (30%) Low (L), (40%) Medium (M) and (30%) High (H).
- *Profitability:* after classifying the return on equity ratio in descending order, the securities are divided into three groups (30%) Robust (R), (40%) Neutral (N) and (30%) Weak (W).
- *Investment:* after classifying the investment to assets ratio in ascending order, the securities are divided into three groups (30%) Conservative (C), (40%) Neutral (N) and (30%) Agressive (A).
- *Illiquidity:* according to their illiquidity ratio, the securities are divided into three groups (30%) Very liquid (V), (40%) Moderately (M) and (30%) Illiquid (I).

Therefore, 14 independent portfolios are formed: S, B, L, M, H, W, N, R, C, N A, I, M and V. The intersection of each of the two size portfolio (S and B) with the other portfolios L, M, H, R, N, W, C, N, A, V, M, I gives 24 portfolios: SL, SM, SH, SR, SN, SW, SC, SN, SA, SV, SM, SI, BL, BM, BH, BR, BN, BW, BC, BN, BA, BV, BM, BI.

Table 2 helps understand the procedure of building the risk premiums: SMB, HML, RMW, CMA and IML.

Table 2. Construction of the risk premiums

SMALL - BIG	SMBB/M = 1/3(SH + SM + SL) – 1/3(BH + BM + BL) SMBOP = 1/3(SR + SN + SW) – 1/3(BR + BN + BW)	**SMB = 1/4(SMBB/M + SMBOP + SMBINV + SMBILL)**
	SMBINV = 1/3(SC + SN + SA) – 1/3(BC + BN + BA)	
	SMBILL = 1/3(SI + SM + SV) – 1/3(BI + BM + BV)	
LOW -MEDIUM- HIGH		**HML= ½ (SH + BH) – ½ (SL + BL)**
ROBUST - NEUTRAL - WEAK		**RMW= ½ (SR + BR) – ½ (SW + BW)**

CONSERVATIVE-NEUTRAL-AGGRESSIVE	**CMA= ½ (SC + BC) – ½ (SA + BA)**
VERY-MODERATELY-ILLIQUID	**IML= ½ (SI + BI) – ½ (SV + BV)**

Empirical results and discussion

Descriptive statistics of the six risk factors are displayed in Table 3. The results reveal that the average value premium, profitability premium, investment premium are positive whereas market premium, size premium and illiquidity premium are negative. The value premium is higher than the market premium, size premium, profitability premium, investment premium, investment premium and illiquidity premium. The standard deviation value of the value premium is higher than other premiums. The Jarque Bera statistics reveal that the series of the market premium, size premium, value premium, profitability premium, investment premium and illiquidity premium are non-normal at one percent level.

Table 3. Descriptive statistics of the six risk factors

	Mean	Std. Dev	Skewness	Kurtosis	Jarque-Bera	Prob
RM_RF	-0.051	0.065	1.338	17.989	1390.985	0.000
SMB	-0.010	0.069	-0.194	4.659	17.417	0.000
HML	0.007	0.081	2.636	15.704	1135.157	0.000
RMW	0.005	0.078	0.065	5.004	24.190	0.000
CMA	0.005	0.071	-1.596	10.850	430.883	0.000
IML	-0.003	0.080	-1.412	9.693	316.612	0.000

Table 4 displays the correlation matrix of the six risk factors. The correlation values reveal that the six risk factors are independent. The highest correlation value is (– 0.342) among the CMA and HML. Then, it is found that there is no multicollinearity among the six risk factors.

Table 4. Correlation Matrix of the six risk factors

	RM_RF	SMB	HML	RMW	CMA	IML
RM_RF	**1**					
SMB	-0.120	**1**				
HML	0.039	-0.278	**1**			
RMW	0.136	0.327	-0.160	**1**		
CMA	0.052	0.066	-0.342	0.316	**1**	
IML	0.017	0.061	-0.314	0.135	0.161	**1**

Table 5 displays the estimation findings of the FF5F model. Applying the OLS technique, it is found that the market premium and value premium are significantly and positively associated with the portfolio excess return. However, the profitability premium is significantly and negatively associated with the portfolio excess return. The results also reveal that the coefficients of the size premium and investment premium are insignificantly influencing the portfolio excess return. Then, market, value and profitability are helpful for describing the portfolio excess return but the size and investment factors are not statistically significant. The abnormal return measured by the alpha coefficient is negative and statistically significant at one percent level. Then, the FF5F model is unable to capture the portfolio returns.

Applying the GARCH (1.1) technique, the results report that the market premium, size premium and value premium are significantly and positively associated with the portfolio excess return. However, the profitability premium is significantly and negatively associated with the portfolio excess return. It is also documented that the coefficient of the investment premium is insignificant. This indicates that the investment premium has no impact on the portfolio excess return. Then, market, size, value and profitability are useful for describing the portfolio excess return, but the investment factor is not statistically significant. The abnormal return measured by the alpha coefficient is insignificant. Then, the FF5F model can capture the portfolio returns when the GARCH technique is used.

From Table 5, the results offered by the OLS and GARCH technique are not identical. Using the OLS technique, it is found that the FF5F model is unable to capture the portfolio returns. However, when the GARCH technique is employed, the results reveal that the FF5F model can fully explain the portfolio returns. In this case, the results offered by the GARCH technique are more privileged because this technique takes into consideration the non-linear aspects (leptokurtosis and volatility clustering) that linear techniques are unable to explain. The findings are in line with the results of Acaravci and Karaomer (2017). They found that the FF5F model can explain the portfolio returns in Turkish stock from July 2005 to June 2016.

Table 5. Estimation findings of the FF5F model

Dependent Variable : RP-RF						
Variable	**C**	**RM_RF**	**SMB**	**HML**	**RMW**	**CMA**
			OLS			
Coefficient	-0.021***	0.347***	0.023	0.146***	-0.096*	0.020
Std. Error	0.004	0.054	0.055	0.046	0.049	0.053
t-Statistic	-4.852	6.432	0.404	3.161	-1.956	0.377
Prob.	0.000	0.000	0.687	0.002	0.052	0.706
Adj. R^2 : 0.269						
			GARCH (1.1)			

Coefficient	-0.006	0.649***	0.080*	0.119***	-0.158***	0.048
Std. Error	0.005	0.064	0.043	0.029	0.030	0.040
z-Statistic	-1.123	10.147	1.819	4.033	-5.186	1.193
Prob.	0.261	0.000	0.069	0.000	0.000	0.233
Adj. R^2: 0.098						

*** and * denote significance at 1% and 10% levels consecutively.

Table 6 presents the estimation findings of the FF5F model with the illiquidity factor. Applying the OLS technique, the results report that the market premium and value premium are significantly and positively associated with the portfolio excess return. However, the profitability premium and the illiquidity premium are significantly and negatively associated with the portfolio excess return. It is also found that the coefficients of the size premium and investment premium are insignificantly influencing the portfolio excess return. Then, only the market, value, profitability and illiquidity variables played an important role in explaining portfolio excess return. The abnormal return measured by the alpha coefficient is negative and statistically significant at one percent level. Then, the FF5F model with the illiquidity factor cannot capture the portfolio returns.

While applying the GARCH (1.1) technique, it is documented that the market premium and value premium are significantly and positively associated with the portfolio excess return. However, the profitability premium and the illiquidity premium are significantly and negatively associated with the portfolio excess return. It is also documented that the coefficients of the size premium and the investment premium are insignificant. Then, only the market, value, profitability and illiquidity factors played a prominent role in explaining the portfolio excess return. This indicates that the size premium and the investment premium have no impact on the portfolio excess return. The alpha coefficient is insignificant, indicating that the FF5F model with illiquidity factor can fully explain the portfolio returns when the GARCH technique is used.

From Table 6, it is reported that the findings offered by the OLS and GARCH technique are not similar. Using the OLS technique, the results reveal that the FF5F model with illiquidity factor is unable to capture the portfolio returns. However, when the GARCH technique is employed, it is found that the FF5F model with illiquidity factor can fully explain the portfolio returns. In this case, the results offered by the GARCH technique are privileged for the same mentioned above. The results are not in line with those found by Racicot and Rentz (2017). Applying the Fama French dataset and the generalized method of momentum, they found that the only important factor in the augmented Fama French six-factor model that involves the liquidity factor is the market factor. They also found that the abnormal return measured by the alpha coefficient is negative and statistically significant.

Table 6. Estimation findings of the FF5F model with illiquidity factor

Dependent Variable: RP-RF							
Variable	**C**	**RM_RF**	**SMB**	**HML**	**RMW**	**CMA**	**IML**
				OLS			
Coefficient	-0.022***	0.348***	0.012	0.100**	-0.082*	0.026	-0.153***
Std. Error	0.005	0.052	0.052	0.046	0.047	0.051	0.043
t-Statistic	-5.106	6.728	0.234	2.166	-1.719	0.497	-3.562
Prob.	0.000	0.000	0.816	0.032	0.088	0.620	0.001
Adj. R^2: 0.327							
				GARCH (1.1)			
Coefficient	-0.005	0.654***	0.069	0.098***	-0.140***	0.053	-0.153***
Std. Error	0.004	0.058	0.044	0.034	0.035	0.043	0.035
z-Statistic	-1.293	11.314	1.552	2.839	-3.956	1.222	-4.396
Prob.	0.196	0.000	0.121	0.005	0.000	0.222	0.000
Adj. R^2: 0.153							

***, ** and * denote significance at 1%, 5% and 10% levels consecutively.

Conclusion

The study of the applicability of the factor models interests practitioners in the stock markets. These models can help portfolio managers to identify extensive factors that impact the equity returns and to estimate the required return on the stock. Moreover, traders employ these factor models to control investment risk. This paper tries to identify the risk factors that have a considerable effect on equity returns. It also examines the performance of the FF5F model and the augmented Fama French six-factor model to explain the portfolio returns in the BRVM between January 2007 and December 2018. For the FF5F model and when the OLS technique is used, it is found that market, value and profitability factors are useful for describing the portfolio excess return but the size and investment factors are not statistically significant. The results also show that the FF5F model cannot capture the portfolio returns. However, when the GARCH technique is used, it is found that all the risk factors except the investment factor have a considerable impact on portfolio excess return. The results also document that the FF5F model can fully explain the portfolio returns. For the FF5F model with illiquidity factor and when the OLS technique is used, it is found that only the market, value, profitability and illiquidity variables played an important role in explaining portfolio excess return. It is also found that the FF5F model with the illiquidity factor is unable to capture the portfolio returns. However, when the GARCH technique is used, the results reveal that only the size premium and the investment premium have no impact on the portfolio excess return. We also document that the FF5F model with the illiquidity factor can fully explain the portfolio returns. In this case, the results offered by the GARCH technique are privileged because this technique takes into consideration the non-linear aspects (leptokurtosis and volatility clustering) that linear techniques are unable to explain. The results found in this paper will push market participants to include the market, value, profitability and illiquidity factors during the asset pricing for taking investment decision and controlling investment risk. Moreover, the results can help portfolio managers to better estimate the required return on the stock by using the Fama-French five- and six-factor models. The failure to take into account several African markets in the study of the applicability of the factor models and the unavailability of more recent accounting data of thirty-four companies traded on the BRVM can be considered as limitations of this study. Then, an eminent extension of this paper would be to examine the performance of the FF5F model and the augmented Fama French six-factor model in several African stock markets to have a broader vision of this topic.

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ZARZĄDZANIE PORTFELEM: BADANIE MODELI WYCENY AKTYWÓW FAMA-FRENCH

Streszczenie: Nowatorskim wkładem tego artykułu jest sprawdzenie, czy pięcio- i sześcioczynnikowe modele Famy-French mogą wyjaśnić zwroty portfelowe na Regionalnej Giełdzie Papierów Wartościowych Wybrzeża Kości Słoniowej (BRVM) w okresie od stycznia 2007 r. do grudnia 2018 r. Dla Famy -Francuski model pięcioczynnikowy, wyniki pokazują, że jedynymi użytecznymi czynnikami do opisania nadwyżki zwrotu portfela są rynek, wartość i rentowność, gdy stosuje się techniki OLS i GARCH. W przypadku rozszerzonego sześcioczynnikowego modelu Famy French, wyniki wskazują, że tylko czynniki rynkowe, wartości, rentowności i braku płynności odegrały znaczącą rolę w wyjaśnieniu nadwyżki zwrotu z portfela. Ponadto, stosując technikę OLS, stwierdzono, że pięcioczynnikowy model Famy-Frencha i rozszerzony sześcioczynnikowy model Famy-Frencha mogą uchwycić zwroty portfela. Jednak w przypadku zastosowania techniki GARCH wyniki pokazują, że modele te mogą w pełni wyjaśnić zwroty z portfela. Osiągnięte wyniki mogą pomóc zarządzającym portfelami zidentyfikować rozległe czynniki, które mają wpływ na zwroty z akcji i oszacować wymagany zwrot z akcji. Co więcej, handlowcy mogą stosować te modele czynnikowe do kontrolowania ryzyka inwestycyjnego.

Słowa kluczowe: pięcioczynnikowy model Famy-Frencha; rozszerzony sześcioczynnikowy model Famy-French; czynniki ryzyka; OLS, GARCH.

投资组合管理:FAMA-法国五要素和六要素资产定价模型的研究

摘要:本文的新贡献是检验 Fama-French 五因子和六因子模型是否可以解释 2007 年 1 月至 2018 年 12 月科特迪瓦地区证券交易所(BRVM)的投资组合收益。对于 Fama - 法国五因素模型，结果表明，当使用OLS和GARCH技术时，描述投资组合超额收益的唯一有用因素是市场、价值和盈利能力。对于增强的FamaFrench六因素模型，结果表明只有市场、价值、盈利能力和非流动性因素在解释投资组合超额收益方面发挥了突出作用。此外，使用OLS技术，发现Fama-French五因子模型和增广Fama-French六因子模型可以捕获投资组合收益。然而，当使用GARCH技术时，结果表明这些模型可以完全解释投资组合的回报。发现的结果可以帮助投资组合经理识别影响股票回报的广泛因素，并估计股票的要求回报。此外，交易者可以使用这些因子模型来控制投资风险。

关键词: Fama-French 五因子模型;增强 Fama-French 六因子模型;风险因素;OLS, 加尔赫。