
Testing Alternative Versions of the Fama-French Three-Factor Model in Frontier Markets: The Case of Jordan

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ABSTRACT

The objective of this study is to examine alternative versions of the Fama-French three-factor model on the Amman Stock Exchange (ASE). We consider two versions of the model: the Fama and French (1993) traditional model and the Cremers et al., (2012) modified model. Specifically, the study uses data on all stocks listed and traded in the regular stock exchange and covers the period from December 2000 through June 2017. To explore the size and book-to-market effects, we form nine portfolios sorted on size/book-to-market. The size/book-to-market portfolios are constructed from an independent sort and rebalanced annually. To evaluate the models, the study applies the Ordinary Least Squares (OLS) time-series regressions approach of Black et al., (1972). The study finds that size and book-to-market effects exist in the ASE equity market returns. The asset pricing tests show that small-size and high-growth portfolios, respectively, appear riskier than big-size and low-growth portfolios and that neither the traditional model nor the modified model is successful in capturing the size and book-to-market effects, however, the traditional model better describes the returns than the modified model on the ASE. The important implications of the results are that for academic researchers, portfolio managers, and individual investors, any applications of the models on the ASE should be made with caution, and that size and value factors construction methods do matter when evaluating the model on the ASE.

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1. INTRODUCTION

The Capital Asset Pricing Model (CAPM) of Sharpe (1964) - Lintner (1965) marks the birth of asset pricing theory. The model is widely used in applications that require the estimation of the cost of capital for firms and evaluating the performance of managed portfolios. Starting in the early 1980s, empirical work appears that challenge the CAPM. For instance, Banz (1981) finds that average returns on small stocks are higher than predicted by the CAPM. Rosenberg et al. (1985) document that stocks with high book-to-market equity ratio have high average returns that are not captured by the CAPM. Fama and French (1992) update the evidence on the empirical failures of the CAPM. In a very influential paper, Fama and French (1993) suggest to augment the CAPM model with two risk-factors; the size factor (SMB) and the value factor (HML). SMB is the monthly difference between the average returns on the three small-stocks portfolios and the average returns on the three big-stocks portfolios, and HML is the monthly difference between the average returns on the two high book-to-market portfolios and the average returns on the two low book-to-market portfolios. The two components they use in constructing each of the SMB and the HML are equally-weighted returns. They find that a regression model (FF3F, henceforth) which uses the three factors outperforms the CAPM in capturing the variation of average U.S. stock returns.

Recently, Blackburn and Cakici (2017) examine the returns of stocks from twenty-one frontier countries, of which Jordan is one of them, over the period from January 2006 through June 2016. They find that size and book-to-market effects are exist for all frontier equity markets together. They employ two versions of the FF3F asset pricing model to capture these anomalies: Local and global models.

The local version of the FF3F model uses factors derived from the twenty-one frontier markets equity returns. The global version of the FF3F model uses the Fama and French (2012) factors derived from developed markets equity returns. They find the local version of the FF3F model outperforms the global version of the model in pricing all frontier equity markets together. If the local version of the FF3F asset pricing model performs better than the global version of the model, then by extension, we might expect that the country version of the FF3F model to outperform the local version of the model. Griffin (2002) shows that a country version of the FF3F asset pricing model explains the average stock returns better than either the world or international versions of the model and suggests that cost-of-capital calculations, performance measurement and risk analysis using FF3F asset pricing model are best done on a within the country basis. In Jordan, Ajlouni, and Khasawneh (2017) empirically test the CAPM and the FF3F model in pricing the Amman Stock Exchange (ASE) equity market returns over the period 2001 through 2010. They find that size and book-to-market effects exist in the ASE. They apply an Ordinary Least Squares (OLS) time-series regression methodology to test the models and find that neither the CAPM nor the FF3F model is successful in capturing the size and book-to-market effects, however, the FF3F model better describes the returns than the CAPM on the ASE. They recommend replacing the CAPM by the FF3F model in practical applications that require the estimation of the ASE equity market returns.

Recently, Cremers et al. (2012) suggest modifications to the formation of the SMB and HML factors in FF3F model to mitigate the non-zero performance of passive indexes, including the S&P 500 and Russell 2000 benchmarks. Specifically, they suggest using value-weighted returns, i.e. based on the market capitalization of the six portfolios used in constructing the factors. They use data cover the period from 1980 to 2005, and find that the modified FF3F asset pricing model performs better than the traditional FF3F model in providing lower tracking error volatility and in assigning zero performance for size/value portfolios. More recently, Michou et al. (2014) find evidence that the differences in measuring each of the SMB and HML factors when evaluating the FF3F asset pricing model in the UK equity market are important. Hence, it is reasonable to assess for the value-weighting approach in measuring SMB and HML factors, as suggested by Cremers et al. (2012), when evaluating the FF3F asset pricing model in Jordan.

The objective of this study is to examine alternative versions of the FF3F asset pricing model on the ASE equity market. Specifically, the study considers two versions of the FF3F asset pricing model; the Fama and French (1993) traditional model (TFF3F, henceforth) and the Cremers et al. (2012) modified model (MFF3F, henceforth). The study uses data on all companies listed and traded in the regular stock exchange and covers the period from December 2000 through June 2017. To explore the size and book-to-market effects, we form nine portfolios sorted on size/book-to-market. The size/book-to-market portfolios are constructed from an independent sort and rebalanced annually. To evaluate the models, the study applies the OLS time-series regressions approach of Black et al. (1972). This study extends the work of Ajlouni and Khasawneh (2017) by extending the sample duration to 17 years and by examining the MFF3F asset pricing model. Ajlouni and Khasawneh (2017) did not investigate the MFF3F model in pricing ASE equity market returns. Moreover, this is the first study to evaluate the MFF3F asset pricing model in a frontier equity market.

The study finds that size and book-to-market effects exist in the ASE equity market returns. The asset pricing tests show that small-size and high-growth portfolios, respectively, appear riskier than big-size and low-growth portfolios. In line with Ajlouni and Khasawneh (2017) finding, we find that neither the TFF3F model nor the MFF3F model is successful in capturing the size and book-to-market effects, however, unlike the Cremers et al. (2012) finding, the TFF3F model better describes the returns than the MFF3F model on the ASE. The important implications of the results are that for academic researchers, portfolio managers, and individual investors, any applications of the models on the ASE should be made with caution. Additionally, the SMB and HML factor construction methods do matter when evaluating the FF3F model on the ASE.

The rest of the paper is organized as follows: Section 2 is a brief overview of the ASE. Section 3 contains the methodology. Section 4 presents the data and variables. Section 5 provides the empirical results and analysis. Finally, Section 6 concludes.

2. A BRIEF OVERVIEW OF THE ASE

The Jordanian Financial Market, established in 1976, is expanded to become the ASE in 1999. It is divided into four main sectors: Banking, Services, Insurance and Industries. The ASE performance considered as one of the best among the Middle-East Arab stock exchanges and the Emerging Markets according to International Finance Corporation report in 2001.

Specifically, in 2000, the trading volume reached JD298 million with a market capitalization of JD3.5 billion. To improve the overall operations of the exchange and encourage investors to participate in the market, the ASE works closely with the Jordan Securities Commission and Securities Depository Center on implementing international standards and best practices regarding market divisions and listing criteria. In this sense, the ASE has made three actions: 1) In 2006, it has introduced a new industrial classification and becomes divided into three main sectors; Financials, Services, and Industries, with a 23 sub-sectors. This new classification is in line with the classification adopted by the U.S. market, Standard & Poor's, but with some minor modifications that render them suitable for the nature of Jordanian companies. 2) In 2007, it has introduced Market Watch Live Service to display live market information. 3) In 2017, the ASE has become a public shareholding company fully owned by the government. As a result, the ASE witnessed an impressive performance during the last decade. By the end of 2017, the trading volume reached JD4.54 billion with a market capitalization of JD16.96 billion.

3. METHODOLOGY

This article examines the two versions of the FF3F asset pricing model: the TFF3F model and the MFF3F model. The models are expressed in equations (1) and (2), respectively, as follows,

$$R_{i,t} - R_{f,t} = \alpha_i + b_i[R_{m,t} - R_{f,t}] + s_i\text{TSMB}_t + h_i\text{THML}_t + \varepsilon_{i,t}, \quad (1)$$

$$R_{i,t} - R_{f,t} = \alpha_i + b_i[R_{m,t} - R_{f,t}] + w_i\text{MSMB}_t + z_i\text{MHML}_t + \varepsilon_{i,t}, \quad (2)$$

Where, $R_{i,t}$ is the return on portfolio i for month t ($t = 1, 2, \dots, T$, and T is the number of months). $R_{f,t}$ is the risk-free rate, $R_{m,t}$ is the market return, TSMB_t and THML_t are the traditional versions of the size and value risk-factors, respectively. MSMB_t and MHML_t are the modified versions of the size and value risk-factors, respectively. α_i is the pricing error of portfolio i , and b_i is the coefficient for the market factor. s_i and h_i are the coefficients for the traditional size and value risk-factors, respectively. w_i and z_i are the coefficients for the modified size and value risk-factors, respectively. Finally, $\varepsilon_{i,t}$ denotes the residuals.

In the regression equations above, the study applies the OLS time-series regressions approach of Black et al. (1972) to obtain the model's estimated coefficients and their corresponding test statistics as well as the mean adjusted R-squared. To test the null hypothesis that all pricing errors are jointly equal to zero, we use the Gibbons et al. (1989) GRS-test statistics. The GRS-statistics is given by,

$$\text{GRS} = \frac{T - N - K}{N} (1 + E_T(f)' \hat{\Omega}^{-1} E_T(f))^{-1} \hat{\alpha}' \hat{\Sigma}^{-1} \hat{\alpha}, \quad (3)$$

Where, N is the number of test assets, K is the number of risk-factors in the model, $E_T(f)$ is the sample mean of the factors, $\hat{\Omega}$ is the sample covariance matrix of the risk-factors, $\hat{\alpha}$ is a vector of the pricing errors, and finally $\hat{\Sigma}$ is the residual covariance matrix in the sample. The test has a finite-sample F distribution with N and $T - N - K$ degrees of freedom and assumes that errors are i.i.d and normally distributed.

We use all stocks listed and traded on the ASE, over the period from December 2000 through June 2017. The average number of stocks over the study period is 214. All stock data, including closing price, book value, market capitalization, and dividend yield, are obtained from the monthly statistical bulletin published on the ASE website.¹ Following Fama and French (1993) filtering rule, a stock must have a trading record and a disclosed positive book value for December of year $t-1$ and June of year t . To reduce the impact of thin trading problem, a stock should have at least three consecutive months of trading record. The average of the number of firms included in the sample over the study period and satisfies these criteria is 163. All data are in Jordanian Dinar (J.D.) currency. The risk-free rate is the one-month Jordanian window rate² published on the Central Bank of Jordan website.³ The monthly rate of return for each stock in the sample is calculated as follows:

$$R_{j,t} = \frac{(P_{j,t} - P_{j,t-1})}{P_{j,t-1}} + DY_{j,t}, \quad (4)$$

¹ <http://www.ase.com.jo>

² We use the one-month window rate as a risk-free rate as the data on three-months or six-months treasury bill rate is not available since November 2008.

³ <http://www.cbj.gov.jo>

Where, $R_{j,t}$ is monthly rate of return of stock j at month t , $P_{j,t}$ is the market closing price of stock j at month t , $P_{j,t-1}$ is the market closing price of stock j at month $t - 1$, and $DY_{j,t}$ is the dividend yield for stock j at month t . As a proxy for market portfolio rate of return, R_m , we use the monthly return to a value-weighted portfolio of all stocks included in the sample.

The market factor is the monthly excess rate of return to the market portfolio, in excess of the return to the one-month Jordanian window rate. In constructing the size and the value factors, we follow the Fama and French (1993) methodology. Specifically, in June of year t , all stocks in the sample are sorted on their market capitalization. The median market capitalization is used as the breakpoint to split stocks into two groups, small (S) and big (B). The same stocks are also resorted based on the book-to-market equity ratio at December of year $t - 1$ to form three book-to-market groups based on the breakpoints for the bottom 30% low (L), 40% middle (M), and 30% high (H). We construct six portfolios from the intersections of the two size and three book-to-market groups (SL, SM, SH, BL, BM, BH). For example, the SL portfolio contains the stocks in the small-size group (S) that are also in the low book-to-market group (L). The monthly value-weighted returns on the six portfolios are calculated from July of year t to June of year $t + 1$, and portfolios are reformed at June of year $t + 1$. The traditional version of the size factor (TSMB) and the value factor (THML) are calculated as follows,

$$TSMB_t = \frac{(SL + SM + SH)}{3} - \frac{(BL + BM + BH)}{3}, \quad (5)$$

$$THML_t = \frac{(SH + BH)}{2} - \frac{(SL + BL)}{2}. \quad (6)$$

The modified version of the size factor (MSMB) and the value factor (MHML) are calculated as follows,

$$MSMB_t = \left(\frac{[SL * V_{SL}] + [SM * V_{SM}] + [SH * V_{SH}]}{V_{SL} + V_{SM} + V_{SH}} \right) - \left(\frac{[BL * V_{BL}] + [BM * V_{BM}] + [BH * V_{BH}]}{V_{BL} + V_{BM} + V_{BH}} \right), \quad (7)$$

$$MHML_t = \left(\frac{[SH * V_{SH}] + [BH * V_{BH}]}{V_{SH} + V_{BH}} \right) - \left(\frac{[SL * V_{SL}] + [BL * V_{BL}]}{V_{SL} + V_{BL}} \right). \quad (8)$$

Where V_{XX} is the market capitalization of a particular portfolio ($XX = SL, SM, SH, BL, BM, BH$).

The test portfolios are 9 portfolios sorted independently on size and book-to-market. In constructing the test assets, we follow Fama and French (1993) methodology. Specifically, in June of year t , all stocks in the sample are sorted on their market capitalization and distributed into three size tertiles groups, small (S), medium (M), and big (B). The same stocks are also resorted based on the book-to-market equity ratio at December of year $t - 1$ to form three book-to-market tertiles groups, low (L), medium (M), and high (H). We construct 9 portfolios from the independent sort of the three size and three book-to-market groups (SL, SM, SH, ML, MM, MH, BL, BM, BH). The monthly value-weighted returns to the nine portfolios are calculated from July of year t to June of year $t + 1$, and portfolios are reformed at June of year $t + 1$.

4. RESULTS AND DISCUSSION

Table 1 displays the descriptive statistics and the Augmented Dickey-Fuller test of the returns to the risk-factors of the TFF3F and MFF3F asset pricing models.

Table 1. Results of Augmented Dickey-Fuller Test

Factors	$R_m - R_f$	TSMB	THML	MSMB	MHML
Mean (%)	0.35	0.57	1.51	1.12	1.03
Standard Deviation (%)	4.91	3.48	5.09	3.72	5.79
ADF-stat	-9.96	-12.85	-12.98	-12.05	-13.19
ADF-p-value	0.00	0.00	0.00	0.00	0.00

According to Table 1, MKT has a mean of 0.35% per month with standard deviation of 4.91%. TSMB and THML have a mean of 0.57% and 1.51% with a standard deviation of 3.48% and 5.09%, respectively. MSMB and MHML have a mean of 1.12% and 1.03% with a standard deviation of 3.72% and 5.79%, respectively. The Augmented Dickey-Fuller test is rejected for all the factors.

The correlations among the risk factors are summarized in Table 2. We notice that TSMB is highly correlated with $R_m - R_f$ and it is negative. This indicates that THML could capture the variation in the ASE equity returns that are not explained by $R_m - R_f$ as well as TSMB. We also notice that MHML is highly correlated with $R_m - R_f$ and it is positive. This indicates that MSMB could capture the variation in the ASE equity returns that are not explained by $R_m - R_f$ as well as MHML. Finally, the correlations between the traditional version of size and value factors with their modified version counterparts are very high. This indicates that the modified version of the size and value factors contains the same information as in the traditional version of the factors.

Table 2. Results of Correlation Coefficients

	$R_m - R_f$	TSMB	THML	MSMB	MHML
$R_m - R_f$	1.00				
TSMB	-0.30	1.00			
THML	0.21	0.14	1.00		
MSMB	0.19	0.81	0.09	1.00	
MHML	0.34	0.13	0.73	-0.09	1.00

Table 3 reports the descriptive statistics and the Augmented Dickey-Fuller test to the monthly excess return to the nine value-weighted portfolios sorted on size and book-to-market, in excess of the one-month window rate. It shows that the mean excess returns to the test assets varies between 0.03% and 2.13%, while the standard deviation varies between 3.42% and 6.41%. If there is a size effect, smaller firms should have higher mean excess returns. We notice that the size effect is exist. If there is a value effect, firms with higher book-to-market ratios should have higher mean excess returns. The results show a large value effect in the ASE; the tendency within size portfolios is for excess returns to increase as book-to-market ratio increases. The Augmented Dickey-Fuller test is rejected in all of the test portfolios. The pattern in size/book-to-market portfolios is consistent with prior studies, such as Fama and French (1993) on the U.S., Blackburn and Cakici (2017) on 21 frontier markets, and Ajlouni and Khasawneh (2017) on the ASE.

Table 3. Descriptive Statistics and the Augmented Dickey-Fuller Test

	Mean excess returns (%)				Standard Deviation (%)		
	Low	Medium	High		Low	Medium	High
Small	0.39	1.16	2.13	Small	4.23	3.98	5.94
Medium	0.08	0.38	0.64	Medium	4.11	5.02	6.01
Big	0.03	0.29	1.23	Big	3.42	4.67	6.41
	ADF stat				ADF p-value		
	Low	Medium	High		Low	Medium	High
Small	-13.38	-8.83	-11.21	Small	0.00	0.00	0.00
Medium	-10.84	-12.47	-10.99	Medium	0.00	0.00	0.00
Big	-10.11	-8.75	-10.01	Big	0.00	0.00	0.00

The results obtained from the OLS time-series regression approach of Black et al. (1972) with the 9 value-weighted portfolios sorted on size and book-market on the TFF3F asset pricing model are presented in Table 4. The table is divided into two panels: Panel A reports the individual regression coefficients and its corresponding t-statistics. Panel B reports the Gibbons et al. (1989) GRS-statistics and its correspond p-value as well as the mean adjusted R-squared. Panel A of Table 4 shows that the null hypothesis that the pricing error α_i is equal to zero is rejected for 2 of the 9 intercepts, at 5% significance level. The loadings of the market factor, b_i , are positive and statistically significant for all the portfolios.

The loadings of the size factor, s_i , of the small-size and medium-size portfolios (except for MH portfolio) are positive, while they are negative for the big-size portfolios (except for BH portfolio). They also decline from the small-size to the big-size portfolios in a monotonic way except for the high book-to-market groups where the decrease is non-monotonic. Additionally, the loadings of the value factor, h_i , of the high book-to-market portfolios are positive, and for the low book-to-market portfolios they are negative. They also increase from the low book-to-market to the high book-to-market portfolios in a monotonic way and across all size portfolios. Moreover, the loadings on the size factor are statistically significant for 6 portfolios and on the value factor they are 7, each out of 9. The better performance of the value factor over the size factor is consistent with the results reported in Table 2. Panel B of Table 4 shows that the GRS-statistics is equal to 2.04. I reject the null hypothesis that all pricing errors are jointly equal to zero. It also shows that the mean adjusted R-squared from the regressions is equal to 42%.

The results obtained from the OLS time-series regression approach of Black et al. (1972) with the 9 value-weighted portfolios sorted on size and book-market on the MFF3F asset pricing model are presented in Table 5. The table is divided into two panels: Panel A reports the individual regression coefficients and its corresponding t-statistics. Panel B reports the Gibbons et al. (1989) GRS-statistics and its correspond p-value as well as the mean adjusted R-squared.

Table 4. Summary Statistics for Black et al. (1972) OLS Time-Series Regressions Tests

Panel A								
		α (%)			t -stat			
		Low	Medium	High				
		Low	Medium	High	Low	Medium	High	
Small		-0.41	0.88*	0.96*	Small	-1.23	2.76	2.51
Medium		0.13	0.15	-0.09	Medium	0.27	0.43	-0.33
Big		0.02	0.11	0.59	Big	-0.19	0.65	1.61
		b_i			t -stat			
		Low	Medium	High				
		Low	Medium	High	Low	Medium	High	
Small		0.41*	0.51*	0.63*	Small	5.32	5.96	6.33
Medium		0.56*	0.59*	0.48*	Medium	6.05	7.99	9.39
Big		0.53*	0.61*	0.49*	Big	10.80	12.07	6.08
		s_i			t -stat			
		Low	Medium	High				
		Low	Medium	High	Low	Medium	High	
Small		0.47*	0.33*	0.49*	Small	4.01	3.50	4.33
Medium		0.21*	0.05	-0.08	Medium	1.99	0.21	-1.01
Big		-0.19*	-0.37*	0.48*	Big	-3.51	-4.73	5.28
		h_i			t -stat			
		Low	Medium	High				
		Low	Medium	High	Low	Medium	High	
Small		-0.23*	-0.00	0.42*	Small	-3.51	-0.09	5.49
Medium		-0.25*	0.13*	0.51*	Medium	-3.77	1.71	7.01
Big		-0.08*	0.09	0.39*	Big	-1.73	1.42	6.33
Panel B								
GRS-stat		2.04						
p-val		0.037						
\bar{R}^2 (%)		42						

Panel A of Table 5 shows that the null hypothesis that the pricing error α_i is equal to zero is rejected for 4 of the 9 intercepts, at 5% significance level. The loadings of the market factor, b_i , are positive and statistically significant for all the portfolios. The loadings of the size factor, w_i , of the small-size and medium-size portfolios are positive, while they are negative for the big-size portfolios. They also decline from the small-size to the big-size portfolios in a monotonic way. Additionally, the loadings of the value factor, z_i , of the high book-to-market portfolios are positive, and for the low book-to-market portfolios they are negative (except for the BL portfolio).

They also increase from the low book-to-market to the high book-to-market portfolios in a monotonic way and across all size portfolios. Moreover, the loadings on the size factor are statistically significant for 7 portfolios and on the value factor they are 3, each out of 9. The better performance of the size factor over the value factor is consistent with the results reported in Table 2. Panel B of Table 5 shows that the GRS-statistics is equal to 3.42. I reject the null hypothesis that all pricing errors are jointly equal to zero. It also shows that the mean adjusted R-squared from the regressions is equal to 38%.

Table 5. Summary Statistics for Black et al., (1972) OLS Time-Series Regressions Tests

Panel A							
α (%)				t -stat			
	Low	Medium	High		Low	Medium	High
Small	-0.73*	0.64*	1.09*	Small	-1.87	1.99	2.67
Medium	-0.09	0.12	-0.08	Medium	-0.05	0.21	-0.24
Big	0.05	0.13	0.72*	Big	0.11	0.78	2.10
b_i				t -stat			
	Low	Medium	High		Low	Medium	High
Small	0.23*	0.42*	0.70*	Small	3.61	6.08	9.02
Medium	0.41*	0.59*	0.68*	Medium	6.39	8.21	11.13
Big	0.57*	0.63*	0.66*	Big	12.85	14.06	8.95
w_i				t -stat			
	Low	Medium	High		Low	Medium	High
Small	0.23*	0.49*	0.78*	Small	1.99	4.69	6.08
Medium	0.05	0.11	0.15*	Medium	0.09	1.03	1.89
Big	-0.21*	-0.21*	-0.33*	Big	-4.03	-2.98	-2.79
z_i				t -stat			
	Low	Medium	High		Low	Medium	High
Small	-0.01	0.03	0.08	Small	-0.07	0.18	-0.39
Medium	-0.05	0.25*	0.46*	Medium	-1.01	2.78	6.09
Big	0.04	0.09	0.52*	Big	1.43	1.52	6.64
Panel B							
GRS-stat	3.42						
p-val	0.001						
\bar{R}^2 (%)	38.4						

Overall, the results in Table 4 and Table 5 show that small-size and high-growth portfolios, respectively, appear riskier than big-size and low-growth portfolios. Consistent with Ajlouni and Khasawneh (2017) finding, the evidence shows that neither the TFF3F model nor the MFF3F model is successful in capturing the size and book-to-market effects, however, unlike the Cremers et al. (2012) finding, the TFF3F model better describes the returns than the MFF3F model on the ASE.

5. CONCLUSION

From a practical point of view, firm managers need information on the cost of equity for financing decisions. In addition, researchers interested in portfolio performance evaluation are interested in models that adequately describe returns. The absence of evidence that there exists an asset pricing model that is adequately describes returns on the ASE equity market therefore leaves researchers and managers in a difficult position. The objective of this study is to examine alternative versions of the Fama-French three-factor asset pricing model on the ASE equity market. Specifically, the study considers two versions of the Fama-French three-factor asset pricing model; the Fama and French (1993) traditional model and the Cremers et al. (2012) modified model.

The study uses data on all stocks listed and traded in the regular stock exchange and cover the period from December 2000 through June 2017. To explore the size and book-to-market effects, we form a nine portfolios sorted on size and book-to-market. The size and book-to-market portfolios are constructed from an independent sort and rebalanced annually. To evaluate the models, the study applies the OLS time-series regressions approach of Black et al. (1972). The study finds that size and book-to-market effects are exist in the ASE equity market returns. The asset pricing tests show that small-size and high-growth portfolios, respectively, appear riskier than big-size and low-growth portfolios.

In line with Ajlouni and Khasawneh (2017) finding, we find that neither the traditional model nor the modified model is successful in capturing the size and book-to-market effects, however, unlike the Cremers et al. (2012) finding, the traditional model better describes the returns than the modified model on the ASE. The important implications of the results is that for academic researchers, portfolio managers, and individual investors, any applications of the models on the ASE should be done with caution. Additionally, the size and value factor construction methods do matter when evaluating the Fama-French three-factor model on the ASE. Fama and French (1995) demonstrate that stocks with high book-to-market equity ratio are associated with distress. Recently, Liu (2006) develops a liquidity-augmented two-factor asset pricing model in which they augment the CAPM model with liquidity risk, and find that the model outperforms the Fama-French three-factor asset pricing model in explaining the variation in the U.S. equity market returns. More recently, Minovic and Zivkovic (2010) find evidence that liquidity risk significantly impact expected asset returns in a frontier market, the Serbian stock market. Whether liquidity risk – in the context of Liu (2006) liquidity-augmented capital asset pricing model – captures the variation in the ASE equity returns, is subject for further empirical investigation.

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