Liquidity Risk and Asset Pricing: Evidence from Amman Stock Exchange

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ABSTRACT

The main aim of this study is to investigate the effect of liquidity risk on the explanatory power of the original model that was introduced by Fama and French three-factor model, using the turnover ratio measurement as liquidity proxies. Using monthly data for the period from January 2007 to December 2013 for a sample of 56 listed companies in Amman Stock Exchange (ASE). The study shows the existence of size, value and liquidity effects. The liquidity factor, although improves the explanatory power of the original model, and is significant in the most portfolios, when applied in the Jordanian Financial Market. The study also shows that adding liquidity factor can improve explanatory power of the CAPM, and the Fama and French three-factor model. The study advices investors and portfolio managers to use the liquidity Four-factor model, because this model provides better explanation to the variation in the portfolios return.

Keywords: Asset Pricing Model, Liquidity Effect, Size Effect, and Value Effect, Turnover Rate, and CAPM.

INTRODUCTION

Markowitz in 1952 examines the relationship between risk and return, through a published paper entitled "Portfolio Selection". Other researchers (Sharpe, 1964; Lintner, 1965; and Mossin, 1966) attempt to find what determine stock returns, and they indicate that only one factor is used to describe the performance of a portfolio or stock market returns as a whole. They created the link between risk and return through a model called the Capital Asset Pricing Model (CAPM) which was developed under certain assumption and indicates that the market performance (return) plays a major role in determining securities returns. It has been considered the most important theoretical model for evaluating the risk and expected return of securities and portfolios. After that Fama and French (1992) expand this model by adding two factors to the CAPM, the firm size (Market Capitalization) and value (Book-to-market ratio). The factors which were added by Fama and French provided a better explanation of the variation in the time series of stock returns. The model was the called the three-factor model, then Carhart (1997) added the momentum factor.

Theoretical model that explains how asset prices are affected by liquidity risk provides a single framework theory which can explain the empirical results which indicates that return is sensitive to market liquidity (Pastor and Stambaugh, 2003), the average liquidity (Amihud and Mendelson, 1986) and returns liquidity and predicts future returns Amihud, (2002). Martinez *et al.,* (2005) show that the liquidity risk can also play an important role in explaining the cross sectional variations on stock returns. Mazouz *et al.* (2009) in an attempt to improve the explanatory power of the CAPM have added more factors, but until now there has been no general agreement as to which model is considered to provide the best

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Received on 23/11/2015 and Accepted for Publication on 3/7/2016.

explanations of the factors that influence stocks return and portfolios return.

This research is trying to test the impact of liquidity risk on portfolios return using the asset pricing models in an emerging Market. The use of liquidity risk in such a context is importance for institutional investors and portfolio managers.

Literature Review

Fame and French (1993) identify common risk factors in the returns on stocks and bonds. They used size, book-to-market ratio and systematic risk measured by β to capture the cross-sectional variation in average stock returns and linked them to bond returns through shared variation in the bond-market factors in NYSE, over the period 1963-1991.The study indicated that a positive, but insignificant relationship between β and average returns. Moreover, the five factors seem to explain average returns on stocks and bonds.

Amihud (2002) examines the relationship between stock returns and stock liquidity over time. According to Amihud ("the ex-ante stock excess return is increasing in the expected illiquidity of the stock market". Using a sample of stocks traded in the NYSE over the period 1963–1997, and applying cross-section and time-series as statistical analytical tools, the results show that predicted market illiquidity has a significant and positive effect on ex-ante stock excess return. However, unpredicted illiquidity has a significant and inversely affects the stock returns. Market illiquidity is calculated as an average illiquidity across stocks in each period; however, the predicted illiquidity is obtained from an autoregressive model.

Mazouz *et al.,* (2009) examine whether systematic liquidity risk has an effect on the London Stock Exchange (LSE), the researchers use proportional quoted ask-bid spread as a proxy for systematic liquidity risk. The sample of the study consists of 642 shares, and covering the period from 1992 to 2007. The result did not find evidence that systematic liquidity risk is priced on the LSE.

Kim and Lee (2011) test the liquidity-adjusted capital asset pricing model of Acharya and Pedersen (2005) for 1962-2009 in the US market using various liquidity measures (illiquidity measure, reversal-measure of illiquidity, Turnover, Zero returns, Liu's measure, LOT, illiquidity measure from Roll, Run length), by using two different test methods: the traditional Fame-Macbeth type of regression and the factor model regression. The sample of the study is priced and trading volume data of common shares for nonfinancial firms as collected. The researchers postulate that some evidence supports the pricing of liquidity risk which arises from the commonality of liquidity.

Al-Mwalla and Karasneh (2011) test the ability of the Fama- French three-factor model to explain the variation in stocks rate of return and investigates the existence of value and size effects in Amman Stock Exchange (ASE), over the period Jun 1999 - June 2010. They show a strong size and strong positive value effects. Their results also indicate that the Fama and French three-factor model provides better explanation for the variation in stocks rates of return than the CAPM.

Al-Mwalla *et al.,* (2012) examine if risk factors provide a better explanation to the variation in stocks rate of return. To achieve the study objectives, time series regressions is used to analyze the performance of the models and to explain the variation in stock returns of different portfolios between 2002 to 2010 for a sample of listed companies traded in (ASE). This study introduces risk factor, such as momentum, distress and leverage to investigate their effect on the explanatory power of the original model that was introduced by Fama and French three-factor model. The study shows the existence of the size, value, momentum, distress and leverage effects in

the ASE. However, adding the Momentum, distress and leverage risk factors did not improve the explanatory power for the three-factor model.

Machado and Machado (2014) examine whether the two-factor model developed by Liu (2006) explains the variation in stock returns in the Brazilian market. Another aim also compares the performance of this model with the CAPM and the three-factor model of Fama and French (1993) and also examine whether the two-factor model is robust strategies based on size, book-to-market, the momentum, earnings / price, cash flow / price, liquidity and leverage. The study uses multiple time series regressions to analyze the performance of the models to explain the variation in stock returns of different portfolios between June 1, 1995 and June 30, 2008. The study shows that two factor model is relevant, since they work with dynamic portfolios. That the two-factor model was not able to explain some of the commonly documented anomaly literature has shown progress, which can be considered a milestone in the literature, although there is much that can be done.

More recently, **Lam and Tam (2015**) test the role of various asset pricing models in the China stock markets. They examine several well-documented asset pricing models. Using both time-series and cross-sectional analysis, additional factors such as portfolio residuals, liquidity factor, higher moments, and on monthly seasonality and conditional-market tests. And to build liquidity factor they used the simple average of the returns on the low-liquidity portfolios minus the returns on the high-liquidity portfolios. The study covers the period starting from July 1995 to June 2012, for every year results in 204 equally weighted monthly returns for each of the six portfolios (SL is the portfolios small size and low liquidity, SM is the portfolios small size and medium liquidity, SH is the portfolios small size and high liquidity, BL is the portfolios big size and low liquidity, BM is the portfolios big size and medium liquidity, BH is the portfolios big size and high liquidity). Also, compared the liquidity four-factor model with alternative factor models, and found that it is the best model in explaining stock returns in China.

Data and Methodology

Data

The study depends on secondary data that have been published in annual reports issued by Jordanian firms; reports and trading data issued by Amman Stock Exchange; and statistical databases issued by The Central Bank of Jordan (CBJ).

The population of the study consists of the Jordanian firms listed in Amman Stock Exchange (ASE) during the period of June 1st, 2007 and Dec 31st, 2013. At the end of 2013, the total number of these firms was 240 firms (source: ASE). The final firms are selected by applying the following criteria:

1. Firm should have full data.
2. Firm should have been incorporated before year 2007.
3. Firm should not have been engaged in acquisitions or merger during the study period.

By applying these criteria, the final sample of this study is restricted to include 56 Jordanian firms.

Rate of return on stock ($R_{i,t}$): The monthly rate of return in percentage of each stock is going to be calculated the use follows equation:-

$$R_{i,t} = \left[\frac{(P_{i,t}-P_{i,t-1})+D_{i,t}}{P_{i,t-1}}\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

- $R_{i,t}$: is the rate of return of the stock $_i$ at month $_t$.
- $D_{i,t}$: is the dividend of stock i at month t.
- $P_{i,t}$: is the average closing prices of the stock i at month t (last trading day).

- $P_{i,t-1}$: is the average closing prices of the stock i at month $_{t-1}$.

The Variables of the Study

There are two types of variables in this study, the dependent variables and the independent variables. The dependent variable is the returns of the portfolio and the independent variables are the liquidity factor (LF), value risk premium (HML) factor, size risk premium (BMS) factor and market risk premium (MRP) factor.

The Dependent Variable

The return of the portfolio: "*the expected rate of return for a portfolio is simple weighted average of the expected rate of return to the securities included in the portfolio*"(Haugen, 2001). Expected rate of return is calculated by using the following formula:

$$R_{p,i} = \sum_{i=1}^{n} W_i * R_i \quad \text{..... (2)}$$

Where:

- $R_{p,t}$: is the return of the portfolio at month t.
- W_i: is the weight of each stock $_i$ in the portfolio.
- R_i: is the expected rate of return to the securities.

The Independent Variables

1. Market Risk Premium (MRP): is the difference between average market return and risk free rate at specific time (Ross *et al*., 2008).

2. Size Risk Premium (SMB) factor: (The second risk factor, small minus big): is one of the three factors in the Fama and French capital asset pricing model. (Ross *et al*., 2008) SMB measured by the difference in returns between small and large sized firms, which is based on the company's market capitalization.

3. Value Risk Premium (HML) factor: the third risk factor, (high minus low) is the difference in the return among a portfolio of value stock, and a portfolio of growth stock. Stocks with low book-to-market ratio is classified as value stocks, otherwise is considered as a growth stock. (Ross *et al*., 2008). HML considered as the different in returns among the growth and value of stocks. HML implies that companies with high book-to-market ratio (value stocks) have a better performance than the firms with low ones (growth stocks) (Fama and Franch, 1993).

4. Liquidity Factor (LF): There are a lot of definitions for the whole liquidity concept. All revolve around one meaning, as the transfer of assets into cash quickly and without loss in value (Ross *et al*., 2008). In this study the researcher used The Turnover Ratio measurement as proxy.

Turnover Rate (TOR)

Datar, Naik and Radcliffe, (1998) proposes an investigation regarding to the role of the liquidity by offering a new measurement. That is different from that which has been proposed by Amihud and Mandelson, (1986). In particular, they use turnover rate as a proxy for liquidity. This measurement is considered to be simple and available, hence can be used on a large scale. Amihud and Mandelson, (1986), are linked with the liquidity of trading frequency. Thus, by observing directly the turnover rate, it is likely to obtain the latter as an alternate for liquidity. They recommended that stock returns are a declining function of the turnover rates. A measure of the liquidity of the stock turnover rate that calculated by trading volume divided by total outstanding share (Amihud and Mandelson, 1986), and calculating by using the following formula:

$$TOR_{i,t} = \frac{VOL_{i,t}}{TOS_{i,t}} \text{..... (3)}$$

Where:

- $TOR_{i,t}$: is the Turn Over Rate to stock i at month t.
- $VOL_{i,t}$: is the trading volume to stock i at month t.
- $TOS_{i,t}$: is the total outstanding share to stock i at month t.

The Models

To achieve the study objective, the researcher uses a time-series test to examine whether the asset pricing model, which includes the size, book-to-market, and liquidity factors, can explain the time-series variations in stock returns. Focus is on investigating whether liquidity factor play an important role in explaining the time-series variations in stock returns. To check the study results, the researcher also provides a test that compare between various asset pricing models such as the CAPM (single factor), liquidity two-factor model, Fama and Franch three-factor model, and liquidity four-factor model. The following Ordinary least squares (OLS) time-series regressions are used

$$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i} MRP_t + \varepsilon_{i,t} \quad \text{…. (4)}$$

$$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i} MRP_t + \beta_{lf,i} LF_t + \varepsilon_{i,t} \quad \text{…. (5)}$$

$$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i} MRP_t + \beta_{hml,i} HML_t + \beta_{smb,i} SMB_t + \varepsilon_{i,t} \quad \text{…… .(6)}$$

$$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i} MRP_t + \beta_{hml,i} HML_t + \beta_{smb,i} SMB_t + \beta_{lf,i} LF_t + \varepsilon_{i,t} \quad \text{…. (7)}$$

Where:

- $R_i - R_{f,t}$: is the portfolio returns in excess of risk free rate at month t;
- MRP_t: $(R_{m,t} - R_{f,t})$ Market risk premium; $R_{m,t}$: is Average market return at month t; $R_{f,t}$ is a risk free at month t;
- LF_t: is the liquidity Factor at month t.
- HLM_t: the HML factor suggests higher risk exposure for typical "value" stocks (high B/M) versus "growth" stocks (low B/M) at month t.
- SMB_t: which is a measure of "size risk", small companies logically should be expected to be more sensitive to many risk factors as a result of their relatively undiversified nature and their reduced ability to realize negative financial events at month t.
- $\varepsilon_{i,t}$: is the error term.
- $\beta_{mrp,i}$, $\beta_{hml,i}$, $\beta_{smb,i}$, $\beta_{lf,i}$: are the coefficients of models.

Portfolios Construction Procedures

In order to construct the HML, SMB, and LF factors, this study used similar constructing mimicking that has been used by (Fama and French, 1996). In June (to avoid most anomalies) of each year (t) all stocks in the sample are ranked based on the firm size using market capitalization as a proxy measure (end of the month closing price times the number of shares outstanding) stocks are assigned into two portfolios of size (Small (S) and Big (B)) based on split point which is 50%, that means the highest 50% stocks are the biggest and the lowest 50% stocks are the small.

SMB (small minus big) is the difference each month between the simple average rate of return on the three small stocks portfolios (SL, SM, and SH) and the simple average rate of return on the three big stocks portfolios (BL, BM, and BH). (Fama and French, 1996).

$$\text{SMB} = \frac{(\text{SL}-\text{BL}) + (\text{SM}-\text{BM}) + (\text{SH}-\text{BH})}{3} \quad \text{…….. (8)}$$

The same stocks are independently resorted into three portfolios based on the book-to-market ratio at June of year t-1, Based on the break point for the bottom 30 % (Low), middle 40% (Medium), and top 30% (High), based on the intersection between two market capitalization groups (S and B) and three books-to-market ratio groups (L, M and H).

HML (high minus low) is the difference each month between the simple average rate of return on two high book-to-market ratio stocks portfolios (SH and BH) and the simple average rate of return on the two low book-to-market ratio equity stocks portfolios (SL and BL).

$$\text{HML} = \frac{(SH-SL)+(BH-BL)}{2} \quad \text{…….. (9)}$$

To construct the LF (liquidity factor) in June of each year (t), the same stocks are independently resorted into three portfolios based on Amihud Illiquidity Ratio measurements at June of year t-1. Based on the break point for the bottom 30 % (Low liquidity), middle 40% (Medium liquidity), and top 30% (High liquidity), and depending on the intersection between two market capitalization (S and B) and three liquidity groups (LL, ML and HL), six value weighted portfolios are formed for each measurements. LF is the simple average of the returns on the low-liquidity portfolios minus the returns on the high-liquidity portfolios:

$$LF = \frac{(SLL-SHL)+(BLL-BHL)}{2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (10)$$

LF (liquidity risk) is the monthly difference between the simple average rate of return on two high liquidity stocks portfolios (SHL and BHL), and the simple average rate of return on the two low liquidity stocks portfolios (SLL and BLL). (Lam and Tam, 2015, pp. 14).

Empirical Results

Summary Statistics

The following table presents the summary statistics results of The Turnover Ratio measurement as a proxy of the liquidity.

Table 1: Average, Standard Deviation, Sharpe Ratio, Min, and Max Monthly Rate of Return in excess of risk free rate for The Turnover Ratio (Six Portfolios):

The Turnover Ratio	Size (Market Capitalization)	
	Mean monthly returns in excess of risk free rate	
	Small size	**Big size**
Low Liquidity	1.89%	1.54%
Medium Liquidity	1.70	2.29
High Liquidity	1.74	1.24
	Standard deviation of monthly returns in excess of risk free rate	
Low Liquidity	6.58%	7.44%
Medium Liquidity	6.54	5.22
High Liquidity	9.40	21.28
	Sharpe ratio*	
Low Liquidity	28.80%	20.64%
Medium Liquidity	26.06	43.82
High Liquidity	18.47	5.85
	Min. monthly returns in excess of risk free rate	
Low Liquidity	-18.20%	-13.90%
Medium Liquidity	-21.70	-23.50
High Liquidity	-19.90	-44.80
	Max. monthly returns in excess of risk free rate	

Low Liquidity	14.30%	40.30%
Medium Liquidity	19.00	8.30
High Liquidity	27.80	70.70

* Sharpe ratio is the mean rate of return divided by Standard Deviation, from July 2007 to June 2013.

Table (1) shows the average monthly rate of return for the six portfolios which represent the dependant variables of this study. It shows that the portfolios with small size outperform the big size portfolios. It also documents a positive relationship between average rate of return and the turnover ratio measurement, the two small portfolios (SL, SH) generated on average higher rate of return than the two big portfolios (BL, BH) by 1.31% on average, but the portfolio (BM) generated on average higher rate of return than portfolio (SM) by 1.35% also the two portfolios with low liquidity (SL, BL) generated (on average) a rate of return that is 1.50% higher than the return generated by those high liquidity (SH, BH) portfolios. In general the small portfolios more sensitivity than big portfolios, The results provide weak evidence supporting the liquidity risk effect in ASE according to the turnover ratio measurement as a proxy of liquidity, and are consistent with (Al-Mwalla *et al*., (2012)).

Table 2: Summary statistics for the factors model monthly returns period (N =84).

Factors	***Mean***	***Std. Dev.***	***Min***	***Max***	***t(Mean)***
LF	-0.003	0.217	-1.379	0.646	0.024
HML	-0.019	0.066	-0.174	0.131	0.007
SMB	0.005	0.044	-0.082	0.104	0.005
MRP	-0.018	0.081	-0.480	0.361	0.009

* T is the mean rate of return divided by its standard error (Standard Deviation/84^.5), from July 2007 to June

Table (2) shows statistics for the factors model monthly returns it indicates that the SMB factor (Size premium) has the highest average excess rate of return and has a reliable size premium in return (0.5% percent per month, t = 0.5%) ranging from (-8.2%) to (10.4%) and standard deviation of (4.4%). hence, there is a strong size premium in rate of return, and this result is consistent with (Lam and Tam, 2015), the market risk premium (MRP) return (-1.8%) percent per month, (t = 0.88%) ranging from (-48.0%) to (36.1%) and standard deviation of (8.1%) came next to the SMB followed by value premium (HML) return (-1.9%) percent per month, (t = 0.72%) ranging from (-17.4%) to (13.1%) and standard deviation of (6.6%), and (LF) return (-0.3%) percent per month, (t = 2.40%) ranging from (-13.79%) to (64.6%) and standard deviation of (21.7%). Table (3) reported the correlation matrix between the independent variables.

Table 3: Correlation Coefficients between the Explanatory Variables

Factors	*LF*	*HML*	*SMB*	*MRP*
LF	1.000			
HML	-0.339	1.000		
SMB	-0.036	-0.368	1.000	
MRP	0.360	-0.038	-0.294	1.000

In general, the independent variables should not be correlated or at least the correlation between independent variables should be low. Accordingly, the correlation coefficient between all factors is low. So that, (LF) the correlation coefficient between (LF) and (SMB) is (ρ=-0.036), which indicates that the (LF) and (SMB) factors are both negatively correlated, and the correlation coefficient between (LF) and (MRP) is (ρ=0.027), which indicates that the (LF) and (MRP) factors are both positively correlated. Though, this result is consistent with (Lam and Tam, 2015). The correlation coefficient between (LF) and (HML) is (ρ=-0.339), which indicates that the (LF) and (HML) factors are both negatively correlated. Though, this result is consistent with (Lam and Tam, 2015). And the correlation coefficient between (SMB) and (HML) is (ρ=-0.368), which indicates that the (SMB) and (HML) factors are both negatively correlated which implies that the variation in (HML) factor have a weak effect in the (SMB) factor estimation this result is consistent with (Lam and Tam, 2015), and the correlation coefficient between (MRP) and (HML) is (ρ=-0.038), which indicates that the (MRP) and (HML) factors are both negatively correlated. Finally, the correlation coefficient between (SMB) and (MRP) is (ρ=-0.294), which indicates that the (SMB) and (MRP) factors are both negatively correlated, and the lowest correlation observed between (LF) and (MRP) factors. And this result is inconsistent with (Lam and Tam, 2015).

Regression Results:

The main purpose of this study to test liquidity risk and pricing models, on the different asset pricing models (the CAPM, Fama and French three-factor model, liquidity two-factor model, and liquidity four-factor model), according to the turnover ratio measurement as a proxy of the liquidity

The CAPM Test

Table 4: The Estimation Result of the CAPM

$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i} MRP_t + \varepsilon_{i,t}$						
Portfolios	**α_i**	**β_{MRP}**	**$t(\alpha_i)$**	**$t(\beta_{MRP})$**	**Adjusted R^2**	**F-Ratio**
SL	-0.017**	0.127	-2.270	1.420	0.012	2.030
SM	-0.013*	0.196**	-1.890	2.260	0.047	5.090**
SH	-0.017	0.035	-1.580	0.270	-0.011	0.070
BL	-0.012	0.194*	-1.440	1.950	0.033	3.810*
BM	-0.017***	0.315***	-3.340	5.040	0.227	25.370***
BH	0.029	0.918***	1.300	3.360	0.110	11.290***

*** Significant different from zero at the 1% level. ** Significant different from zero at the 5% level. * Significant different from zero at the 10% level. **SL** is the portfolios small size and low liquidity, **SM** is the portfolios small size and medium liquidity, **SH** is the portfolios small size and high liquidity, **BL** is the portfolios big size and low liquidity, **BM** is the portfolios big size and medium liquidity, **BH** is the portfolios big size and high liquidity.

Table (4) reports the result of the (CAPM) test according to the turnover ratio measurement as a proxy of liquidity. The table shows that The (MRP) factor coefficients are significant in all portfolios at α= 1% except the (SL, and SH) portfolios. But these MRP coefficients give incorrect direction to the excess rate of return for the portfolios that are reported in Table (1). This evidence can reduce the ability of the CAPM in predicting the monthly excess rate of return in ASE. This evidence is consistent with (Machado and Machado, 2014) in Brazilian, and (Al-Mwalla *et al*., 2012) in Jordan.

The Liquidity Two-Factor Model Test

Table 5: The Estimation Result of the Liquidity Two-Factor Model

$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i} MRP_t + \beta_{lf,i} LF_t + \varepsilon_{i,t}$								
Portfolios	**α_i**	**β_{MRP}**	**β_{LF}**	**$t(\alpha_i)$**	**$t(\beta_{MRP})$**	**$t(\beta_{LF})$**	**Adjusted R^2**	**F-Ratio**
SL	-0.017**	0.089	0.039	-2.35	0.93	1.11	0.015	1.63
SM	-0.015**	0.104	0.095***	-2.16	1.17	2.84	0.123	6.800***
SH	-0.019*	-0.129	0.169***	-1.93	-1	3.51	0.111	6.200***
BL	-0.011	0.219**	-0.026	-1.39	2.05	-0.64	0.026	2.1
BM	-0.019***	0.215***	0.103***	-4.04	3.59	4.59	0.379	26.330***
BH	0.185	0.215	0.725***	1.21	1.08	9.75	0.586	59.650***

*** Significant different from zero at the 1% level. ** Significant different from zero at the 5% level. * Significant different from zero at the 10% level. **SL** is the portfolios small size and low liquidity, **SM** is the portfolios small size and medium liquidity, **SH** is the portfolios small size and high liquidity, **BL** is the portfolios big size and low liquidity, **BM** is the portfolios big size and medium liquidity, **BH** is the portfolios big size and high liquidity.

Table (5) reports the result of the liquidity tow-factor model test according to the turnover ratio measurement as a proxy of liquidity. The table shows that (MRP) factor coefficients are insignificant in all portfolios except the (BL, and BM) portfolios are significant at α = 5%, and (LF) factor coefficients are significant in all portfolios at α = 1% except the (SL, and BL) portfolios. But these (MRP) coefficients give incorrect direction to the excess rate of return for the portfolios that are reported in Table (1). Though, these results oppose the results in table (1), and these (LF) coefficients give incorrect direction to the excess rate of return for the portfolios, that are reported in Table (1). The LF beta coefficients indicate that the big portfolios are more risky than the small portfolios at the same level of the intersection with liquidity and these big portfolios should generate average rate of return that exceeds the rate of return generated by small portfolios. This evidence can reduce the ability of the liquidity two-factor model in predicting the monthly excess rate of return in ASE. This evidence is inconsistent with (Machado and Machado, 2014) in Brazilian, and (Al-Mwalla *et al*., 2012) in Jordan. The results reported for the adjusted R^2 range from 1.5% to 58.6%. The lower of 1.5% is for the portfolios with the smallest market capitalization and low liquidity. The highest of 58.6% is for the portfolios with the biggest market capitalization and high liquidity.

The Fama and French Three-Factor Test

Table 6: The Estimation Result of the Fama and French Three-Factor Test

$$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i}MRP_t + \beta_{hml,i}HML_t + \beta_{smb,i}SMB_t + \varepsilon_{i,t}$$

Portfolios	α_i	β_{MRP}	β_{SMB}	β_{HML}	$t(\alpha_i)$	$t(\beta_{MRP})$	$t(\beta_{SMB})$	$t(\beta_{HML})$	Adjusted R2	F-Ratio
SL	-0.010	0.288***	0.923***	0.439***	-1.600	3.710	6.010	4.490	0.333	14.790***
SM	-0.009	0.363***	0.983***	0.334***	-1.500	4.870	6.650	3.550	0.376	17.670***
SH	-0.020*	0.171	0.866***	-0.069	-1.950	1.350	3.470	-0.430	0.135	5.330**
BL	-0.006	0.233**	0.184	0.302**	-0.760	2.250	0.900	2.320	0.071	3.110**
BM	-0.017***	0.322***	0.041	0.013	-3.130	4.790	0.310	0.150	0.209	8.290***
BH	0.007	0.839***	-0.268	-1.150***	0.330	3.070	-0.490	-3.340	0.207	8.200***

*** Significant different from zero at the 1% level. ** Significant different from zero at the 5% level. * Significant different from zero at the 10% level. **SL** is the portfolios small size and low liquidity, **SM** is the portfolios small size and medium liquidity, **SH** is the portfolios small size and high liquidity, **BL** is the portfolios big size and low liquidity, **BM** is the portfolios big size and medium liquidity, **BH** is the portfolios big size and high liquidity.

The (MRP) factor coefficients are significant in all portfolios at α = 5 % except the (SH) portfolio. The results in table (6) are consistent with the results on the (MRP) coefficients reported in table (4). The SMB factor coefficients are significant in all small portfolios at α = 1%, but all big portfolios are insignificant. For HML factor, the HML coefficients are significant in all portfolios at α = 5% except the (SH, and BM) portfolios. The increase in the coefficients for SMB, HML reflect the variation in the rate of return among portfolios. The results about size effect and value effect and the variation in rate of return are consistent with (Al-Mwalla *et al.,*

2012) in Jordan, Nevertheless, regarding the ability of the (SMB), and (HML) factors to reflect the variation in rate of return between small and big portfolios, the results in table (6) suggests that together factors have the same ability to reflect the variation in rate of return between small and big portfolios. Table (6) shows that the three-factor model leaves enough variation in rate of return unexplained especially for the (BM) portfolios. The results reported for the adjusted R^2 range from 7.1% to 37.6%. The lowest of 7.1% is for the portfolio with the biggest market capitalization and low liquidity. The adjusted R^2 s has a trend to reduce with the raise in market capitalization (size). Table (6) shows that the small portfolios relative to big portfolios provide better explanation to return variation

Liquidity Four-Factor Test

Table (7) shows that The (MRP) factor coefficients are significant in all portfolios at $\alpha = 5\%$ except the (SH, and BH) portfolios. The results in table (7) are consistent with the results on the (MRP) coefficients reported in table (6). On the other hand, the (MRP) coefficients do not explain the variation in rate of return. The SMB factor coefficients are significant in all small portfolios at $\alpha = 1\%$, but all big portfolios are insignificant. The coefficients for SMB factor become higher when moving to higher liquidity portfolios in small size, and are reversed in big size portfolios. For HML factor, the HML coefficients are significant in all portfolios at $\alpha=10\%$ except the (SH and BH) portfolios. For LF factor, the LF coefficients are significant in all portfolios at $\alpha = 1\%$ except the (BH) portfolio. The results presented in table (7) are consistent with the result in table (1) for the size and value effect in ASE. The increase in the coefficients for SMB, HML, and LF reflect the variation in the rate of return among portfolios. The results about size effect and value effect and the variation in rate of return are consistent with (Al-Mwalla *et al.,* 2012) in Jordan, and about liquidity effect is consistent with (Machado and Machado, 2014) in Brazilian and (Lam and Tam, 2015) in china. Nevertheless, regarding the ability of the (SMB), (HML), and (LF) factors to reflect the variation in rate of return between small and big portfolios, the results in table (7) suggests that together factors have the same ability to reflect the variation in rate of return between small and big portfolios. It shows that the liquidity four-factor model leaves enough variation in rate of return unexplained especially for the (BH) portfolio. The results reported for the adjusted R^2 range from 5.9% to 58.6%. The lowest of 5.9% is for the portfolio with the biggest market capitalization and low liquidity. The adjusted R^2 s has a trend to increase with the raise in size. The same table also shows that explanatory power is improved to the small portfolios relative to big portfolios.

Table 7: The Estimation Result of the Liquidity Four-Factor Model

$R_i - R_{f,t} = \alpha_i + \beta_{mrp,i}MRP_t + \beta_{hml,i}HML_t + \beta_{smb,i}SMB_t + \beta_{lf,i}LF_t + \varepsilon_{i,t}$

Portfolios	α_i	β_{MRP}	β_{SMB}	β_{HML}	β_{LF}	$t(\alpha_i)$	$t(\beta_{MRP})$	$t(\beta_{SMB})$	$t(\beta_{HML})$	$t(\beta_{LF})$	Adjusted R2	F-Ratio
SL	-0.009	0.213***	0.952***	0.537***	0.085***	-1.570	2.710	6.450	5.380	2.840	0.387	14.080***
SM	-0.008	0.247***	1.029***	0.488***	0.133***	-1.540	3.570	7.950	5.580	5.080	0.524	23.820***
SH	-0.019*	0.023	0.924***	0.126	0.168***	-1.960	0.190	3.950	0.790	3.540	0.244	7.710***
BL	-0.006	0.228**	0.186	0.310**	0.006	-0.750	2.060	0.900	2.210	0.150	0.059	2.310*
BM	-0.016***	0.218***	0.081	0.150*	0.118***	-3.390	3.490	0.700	1.890	5.000	0.391	14.320***
BH	0.012	0.238	-0.033	-0.355	0.686***	0.770	1.130	-0.080	-1.340	8.620	0.586	30.340***

*** Significant different from zero at the 1% level. ** Significant different from zero at the 5% level. * Significant different from zero at the 10% level. **SL** is the portfolios small size and low liquidity, **SM** is the portfolios small size and medium liquidity, **SH** is the portfolios small size and high liquidity, **BL** is the portfolios big size and low liquidity, **BM** is the portfolios big size and medium liquidity, **BH** is the portfolios big size and high liquidity.

Conclusion

The main purpose of this study is to measure and to examine the impact of the liquidity risk on the portfolios return, using the turnover rate as liquidity proxies. Using monthly data covering the period from June 1st, 2007 and Dec 31st, 2013 for a sample consists of 56 listed companies whom trade in Amman Stock Exchange (ASE). This study investigates the liquidity risk effect on the explanatory power of the original model that was introduced by Fama and French Three-factor model, and which has been tested by (Al Mwalla and Karasneh) using data from ASE. The study also test and compare various asset pricing models such as the CAPM, liquidity two-factor model, FF three-factor model, and liquidity four-factor model. The study shows the existence of size, value and liquidity, (which have weak evidence) effect in the Jordanian Market. Also the study shows that the three-factor model can provide better explanation to the small portfolios relative to big portfolios. Comparing Fama and French three-factor models provide better explanation to the variation in stocks rate of return than the CAPM. In addition to, the liquidity two-factor models provide better explanation to the variation in stocks rate of return than the CAPM, and the liquidity Four-factor models provide better explanation to the variation in stocks rate of return than the Fama and French three-factor model. Finally adding liquidity factor can improve the CAPM, the Fama and French three-factor model. The study advices investors and portfolio managers to use the liquidity Four-factor model, because this model provides better explanation to the variation in the portfolios return, and advices investors and portfolio managers in ASE to invest in portfolios with smallest market capitalization (size) and medium liquidity, according to the liquidity measurement used in the study, because investing in this portfolio is considered as the best portfolio result by using the study models.

REFERENCES

Acharya, V. V., and Pedersen, L. H. (2005). Asset Pricing with Liquidity Risk. ***Journal of Financial Economics,*** *77(2): 375-410.*

Al-Mwalla, M. (2012). Can Book-to-Market, Size and

Momentum be Extra Risk Factors that Explain the Stocks Rate of Return? Evidence from Emerging Market. ***Journal of Finance, Accounting and Management,*** *3(2) :42-57.*

Al-Mwalla, M., Al-Qudah, K. A., and Karasneh, M. (2012). Additional Risk Factors that Can be Used to Explain more Anomalies: Evidence from Emerging Market. ***International Research Journal of Finance and Economics,*** No. 99.

Al-Mwalla, M., and Karasneh, M. (2011). Fama and French Three-factor model: Evidence from Emerging Market. ***European Journal of Economics, Finance and Administrative Sciences,*** *Vol. 41: 132-140.*

Amihud, Y. (2002). Illiquidity and Stock Returns: Cross-Section and Time-Series Effects**.** ***Journal of Financial Markets****, 5 (1): 31-56*.

Amihud, Y., and Mendelson, H. (1986). Asset Pricing and the Bid-Ask Spread**.** ***Journal of Financial Economics,*** *17(2): 223-249.*

Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. ***The Journal of Finance*****,** *52*(1): 57-82.

Fama, E. F. (1991). Efficient Capital Markets: II. ***The Journal of Finance***, *46*(5): 1575-1617.

Fama, E. F., and French, K. R. (1992). "The Cross-Section of Expected Stock Returns". ***Journal of Finance*** *47. (2):427–465.*

Fama, E. F., and French, K. R. (1993). Common Risk Factors in the Returns on Stocks and Bonds. ***Journal of Financial Economics****, 33(1): 3-56.*

Fama, E. F., and French, K. R. (1996). Multifactor explanations of asset pricing anomalies. ***The Journal of Finance***, *51(*1): 55-84.

Kim, S., and Lee, K. H. (2011). Pricing of Liquidity Risks by Alternative Liquidity Measures**.** ***Working Paper, Korea University Business School, and Seoul National University Business School.***

Lam, K. S., and Tam, L. H. (2015). Asset Pricing and Liquidity Risk: China Evidence. ***Working Paper, University of Macau.***

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets**.** ***The Review of Economics and Statistics*****,** *pp.* 13-37.

Machado, M. A. V., and Machado, M. R. (2014). Liquidity and Asset Pricing: Evidence from the Brazilian Market. ***Brazilian Business Review***, *11(1):. 69-89.*

Markowitz, H.M. (March 1952). "Portfolio Selection*"*. ***The Journal of Finance*** *7 (1): 77–91.*

Martinez, M., Nieto, B., Rubio, G., and Tapia, M. (2005). Asset Pricing and Systematic Liquidity Risk: An Empirical Investigation of the Spanish Stock Market**.** ***International Review of Economics and Finance***, Vol. 14: 81-103.

Mazouz, K., Alrabadi, D. W., and Freeman, M. C. (2009). Systematic Liquidity Risk and Asset Pricing: Evidence from London stock Exchange. ***Available at SSRN 1405705.***

Mossin, J. (1966). Equilibrium in a Capital Asset Market. ***Econometrics: Journal of the Econometric Society***, pp. 768-783.

Pastor, L., and Stambaugh, R. F. (2003). Liquidity Risk and Expected Stock Returns**,** ***The Journal of Political Economy****,3(3): 642.*

Ross, S., R. Westerfield, J. Jaffe, and B. Jordan (2008), Modern Financial Management, 9th edition, **McGraw-Hill/Irwin.**

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. ***The Journal of Finance***, *19 (*3): 425-442.

مخاطر السيولة، وأثرها على تسعير الأصول : دليل من بورصة عمان للأوراق المالية

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ملخص

إن الهدف الرئيس للدراسة التحقق من مخاطر السيولة وأثرها على قوة التفسير لنموذج التسعير الأصلي المُنشأ من قبل (Fama and French)، والذي يسمى نموذج ثلاثي العوامل (Three-Factor Model)، وذلك بإستخدام معدل دوران حجم التدول (Turnover Rate) كمقياس للسيولة. وباستخدام بيانات شهرية عن الفترة من كانون الثاني 2007 إلى كانون الأول 2013 لعينة مكونة من 56 شركة مدرجة في بورصة عمان. وقد أظهرت نتائج الدراسة وجود أثر لعامل الحجم، وعامل القيمة، وعامل السيولة. وأن عامل السيولة يحسّن من القوة التفسيرية للنموذج الأصلي في السوق الأردني في تشكيلات كل المَحَافظ. وكذلك تم إيجاد أثر ذو دلالة إحصائية لعامل السيولة في معظم المحافظ. كما أظهرت نتائج الدراسة أن إضافة عامل السيولة يمكن أن يحسن نموذج تسعير الأصول الرأسمالية، ونموذج ثلاثي العوامل (Fama and French Three-Factor Model). وعليه أوصت الدراسة أن يقوم مدارء المَحَافظ والمستثمارين باستخدام نموذج (Fama and French)، والذي يسمى نموذج ثلاثي العوامل (Three-Factor Model) مع إضافة عامل السيولة عند تكوين المحافظ؛ وذلك لأن النموذج يفسر الاختلاف في العوائد بطريقه أفضل.

الكلمات الدالة: نموذج تسعير الأصول، عامل السيولة، عامل الحجم، عامل القيمة، معدل دوران لحجم لتدول، ونموذج تسعير الأصول الرأسمالية.

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تاريخ استلام البحث 2015/11/23، وتاريخ قبوله 2016/7/3.