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Price behavior of small and medium enterprises on the Saudi stock exchange in the face of market illiquidity

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ABSTRACT

This research examines the impact of market illiquidity on asset prices. This topic has been widely discussed in the U.S. market, particularly in relation to the effects on small-caps and large-caps. The objective of this study is to investigate the relationship between returns and market illiquidity shocks on the Saudi stock exchange, with a specific focus on medium and small capitalizations. Small and medium enterprises (SMEs) in Saudi Arabia play a significant role in driving economic growth, comprising 99.5% of the private sector. Given their importance in diversifying the Saudi economy and enhancing non-oil sectors, it is crucial to examine how the stock prices of these enterprises respond to market liquidity issues. To achieve this, illiquidity shocks are estimated for the Saudi stock exchange, followed by an assessment of the overtime relationship between SME returns and the estimated shocks using seven industrial group portfolios. The estimation results validate previous findings and demonstrate that illiquidity shocks in the Saudi market lead to lower prices for all SMEs, irrespective of their industrial group. Moreover, I explore whether this relationship differs between medium and small enterprises. Previous studies have suggested that market illiquidity shocks have a more pronounced impact on the stock prices of small capitalizations compared to large capitalizations. However, my estimation results indicate that the negative effects of illiquidity shocks on stock prices do not significantly differ between medium-sized and small-sized enterprises. This finding is attributed to the lack of substantial disparities in the time-series returns of both portfolio sizes.

1. Introduction

In light of significant transformations that have taken place, there is a need for a deeper understanding of the Saudi stock exchange. These transformations have been prompted by the Saudi strategic program known as "Vision 2030," which was formulated as a response to the challenges faced by Saudi Arabia following the sharp decline in oil prices in 2014. The overarching objective of Vision 2030 is to reduce the country's dependence on oil by diversifying the economy and promoting investments in the private sector (Allmnakrah and Evers, 2020). Noteworthy changes have occurred in the Saudi stock market. In June 2015, foreign investors were granted access to the market for the first time. Subsequently, in January 2017, a new classification system for listed companies was introduced, consisting of 24 industry groups. In February 2017, a parallel equity market called "Nomu" was established, providing an alternative platform for companies to go public with less stringent listing requirements. After two years, the structure of Nomu was revised to specifically support Small- and Medium-sized Enterprises (SMEs). One of the primary objectives of Saudi Vision 2030 is to increase the contribution of SMEs to the gross domestic product. SMEs serve as catalysts for introducing previously absent sectors into the Saudi economy, fostering innovation, and bolstering exports. Their role in promoting diversification and economic growth in Saudi Arabia is of paramount importance. Consequently, investigating the behavior of these enterprises in the stock market becomes intriguing. Such exploration enables investors and traders to make informed investment decisions, mitigating the potential costs associated

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with illiquidity when dealing with the stocks of SMEs, and necessitating an illiquidity premium as compensation for the inherent liquidity risks associated with these companies (Alharbi, 2022).

Indeed, Amihud (2019) and Amihud and Noh (2021) examined the illiquidity risk using the return premium of illiquidity. They prove that investors require an illiquidity premium to compensate for systematic illiquidity risk. Illiquidity risk is measured by illiquidity beta which was introduced by Pástor and Stambaugh (2003) who defined the illiquidity risk by the sensitivity of returns to market illiquidity shocks. Watanabe and Watanabe (2008) and Acharya et al. (2013) proved also that market illiquidity shocks have a negative effect on both U.S stocks and bonds, and this effect is stronger on small capitalizations and in times of economic distress. Acharya et al. (2013) showed that investment-grade bonds are less sensitive to illiquidity shocks than speculative-grade bonds. These findings are also confirmed in the empirical study of Ben Soltane and Naoui (2021) on the Tunisian stock exchange where political turmoil raises the negative effect of market illiquidity shocks on stock returns, particularly on small caps returns. The Amihud (2002) ratio is the illiquidity measure employed in these studies. Lee (2011) used the ratio "zero-return" of Lesmond et al. (1999) as an illiquidity measure to investigate the relationship between market illiquidity shocks and stock returns on a global level. He finds that illiquidity shocks lower stock prices independently of market risk in international financial markets. Bekaert et al. (2007) confirmed the negative relationship between market illiquidity shocks and stock returns on emerging markets using also the "zero-return ratio. In all these studies, market illiquidity shocks are defined by innovations on the expected market illiquidity. They follow the methodology of Amihud (2002) where investors are supposed to predict market illiquidity based on the previous levels of market illiquidity observed on markets.

In this study, I also follow the methodology of Amihud (2002) to estimate market illiquidity shocks on the Saudi stock exchange. I examine the behavior of SMEs towards market illiquidity shocks by setting two goals. The first goal is to explore the over-time relationship between SMEs' stock returns and illiquidity shocks. The second goal is to test whether this relationship differs between medium to small enterprises. I proceed as follows. The methodology is described in the next section. Section 3 includes results and discussion. Section 4 concludes my research.

2. Methodology

My empirical study focuses on daily data of all SMEs that are continuously listed on the Saudi Stock Exchange from December, 31st 2014 until July, 1st 2020. The Saudi General Authority for SMEs, called "Monshaat," determines when a company is considered an SME and distinguishes between "medium," "small" and "micro-enterprise" as follows: "Medium enterprise" is the company that maintains its number of full-time employees (FTE) between 50 and 249 with annual revenue between 40 and 200 Million Saudi Riyal (SAR), while "Small enterprise" is the company that maintains its number of FTE between 6 and 49 with annual revenue between 3 and 40 Million SAR, and "Microenterprise" has at most 5 FTE and 3 Million SAR of annual revenue. The study period is chosen so that a maximum of listed SMEs can be included in the sample. Stocks of Saudi SMEs without market return and volume data during several days are removed from the sample, in order to make estimates parameters more reliable. The final sample includes twenty SMEs covering seven industry groups (Capital Goods, Insurance, Real Estate Management and Development, Consumer Durables and Apparel, Food and Beverages, Consumer Services, and Materials). According to the classification of the Saudi Authority of SMEs, the final sample is composed of seventeen medium enterprises and three small enterprises. Micro enterprises are excluded from the sample due to their late listing on the market in 2017.

Data consists of daily trading volume and prices of the Saudi market index (*TASI*, Tadawul All Share Index), and of stocks of SMEs in the sample. The daily market return is determined by:

$$R_{M,d} = 100 \times \left[\left(\ln P_{M,d}\right) - \left(\ln P_{M,d-1}\right)\right] \quad (1)$$

where, $P_{M,d}$ and $P_{M,d-1}$ are the values of *TASI* at the end of day *d* and day *d-1* respectively. Similarly, the daily return of stock *i* is computed as follows where $P_{i,d}$ and $P_{i,d-1}$ are the stock's closing prices on days d and d-1 respectively:

$$R_{i,d} = 100 \times \left[\left(\ln P_{i,d}\right) - \left(\ln P_{i,d-1}\right)\right] \quad (2)$$

I use the illiquidity measure of Amihud (2002) to evaluate the level of illiquidity in the Saudi stock market. The illiquidity level of the market at week t is determined by:

$$Milliq_t = \frac{1}{N} \times \sum_{d=1}^{N_{d,t}} \frac{\left|R_{M,d,t}\right|}{Vol_{M,d,t}} \quad (3)$$

where, $\left|R_{M,d,t}\right|$ and $Vol_{M,d,t}$ are respectively the (absolute) daily return of the market index on day *d* in week *t* and the trading volume of the market (in million Saudi Riyal, SAR) on day *d* in week *t*. *N* is the number of selected stocks. Unexpected levels of market illiquidity are considered shocks of market illiquidity. They are measured by the residuals extracted from the autoregressive model that predicts market illiquidity according to the methodology of Amihud (2002). The idea is that investors predict market illiquidity for week t based on the information of week t-1 in order to set their prices that generate the required return in week t. Hence, the following autoregressive model is introduced:

$$Milliq_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i \times Milliq_{t-1} + u_t \quad (4)$$

where, α_0 and α_i are coefficients, n is the delay of the autoregressive model and should be chosen so that residuals are serially uncorrelated. u_t are the residuals which once extracted represent the shocks of market illiquidity, $Silliq_t$:

$$\hat{u}_t = Silliq_t \quad (5)$$

The first objective of my empirical study is to measure the sensitivity of SMEs' returns to illiquidity shocks in the Saudi stock market. SMEs in the study sample originally belong to seven industrial groups that are among the 24 industrial groups defined by the Saudi stock exchange. I sort the selected SMEs stocks into 7 portfolios. Each portfolio corresponds to an industrial group. I estimate the sensitivity of each portfolio returns to the Saudi market illiquidity shocks through the following regression. This regression is inspired by the empirical study of Watanabe and Watanabe (2008) who simply regressed excess stock returns on market illiquidity shocks to parsimoniously estimate illiquidity beta without including other market variables.

$$R_{p,t} = \alpha_t + (\beta_S \times Silliq_t) + \varepsilon_t \quad (6)$$

where, $R_{p,t}$ is the portfolio return at week t, p is one of the seven portfolios (each portfolio corresponds to the industrial group to which the selected SMEs belong, i.e., insurance, materials, Real estate and development, capital goods, Foods and Beverages, Consumer services and Consumer durables and Apparels). The coefficient β_S (illiquidity risk) measures the sensitivity of the portfolio return to market illiquidity shocks that are designed by $Silliq_t$. α_t is the intercept in the regression. ε_t represents the regression residual.

The second objective of this study is to test whether the sensitivities of SMEs returns vary according to the firm size. Then, I sort the stocks of the selected SMEs into two sized portfolios: A portfolio of small enterprises and a portfolio of medium enterprises. Distinguishing between medium and small firms is based on the classification of the Saudi General Authority for Small and Medium Enterprises. Both portfolios are characterized by returns that are computed by the equally-weighted average of weekly returns $R_{i,t}$ of stocks included in each portfolio as follows:

$$R_{MED,t} = \frac{1}{N_{MED}} \sum_{i=1}^{N_{MED}} R_{i,t} \quad (7)$$

$$R_{Small,t} = \frac{1}{N_{Small}} \sum_{i=1}^{N_{MED}} R_{i,t} \quad (8)$$

where, N_{MED} and N_{Small} are the numbers of stocks included in each portfolio, and the return of stock i at week t is computed by $R_{i,t} = 100 \times \left[\left(\ln P_{i,d}\right) - \left(\ln P_{i,d-5}\right)\right]$. Sensitivities of portfolio returns to illiquidity shocks are estimated by the followings regressions:

$$R_{MED,t} = \alpha_{MED} + (\beta_S^{MED} \times Silliq_t) + \varepsilon_{MED,t} \quad (9)$$

$$R_{Small,t} = \alpha_{Small} + \left(\beta_S^{Small} \times Silliq_t\right) + \varepsilon_{Small,t} \quad (10)$$

where, The illiquidity of betas β_S^{MED} and β_S^{Small} measure the sensitivities of the realized returns of both portfolios to market illiquidity shocks. α_{MED} and α_{small} are the intercepts in the regressions. $\varepsilon_{MED,t}$ and $\varepsilon_{Small,t}$ are the residuals of the regressions.

3. Results and discussions

Examination of the time series of Market illiquidity ($Milliq_t$) reveals that the autocorrelation coefficient of $Milliq_t$ is equal to 0.52 at a weekly frequency. This means that at week t market illiquidity is explained by 52% of observed market illiquidity in the previous week. Moreover, the result of the Augmented Dickey-Fuller (ADF) test shows the absence of a unit root in the time-series of $Milliq_t$. Therefore, the autoregressive model is specified to predict levels of market illiquidity based on previous levels as follows:

$$Milliq_t = \alpha_0 + \sum_{i=1}^{5} \alpha_i \times Milliq_{t-1} + u_t \quad (11)$$

where, α_0 and α_i are coefficients and u_t is the residual. Delay 5 of the autoregressive model is chosen so that residuals are serially uncorrelated, i.e. their autocorrelation coefficient is equal to -0.005. Then, market illiquidity shocks are determined by extracting residuals from the autoregressive model AR(5), following the methodology of Amihud (2002) which is also followed by Pástor and Stambaugh (2003), Watanabe and Watanabe (2008), Acharya et al. (2013), Amihud (2019), Amihud and Noh (2021), Ben Soltane and Naoui (2021), and Ben Soltane et al. (2022). $\hat{u}_t$, the extracted residuals from AR(5) in Eq. 11, are interpreted as the shocks in market illiquidity designed by $Silliq_t$.

Results of the ADF test prove that $Silliq$ times-series is stationary (ADF statistic=-6,92, probability=0.00). This is also shown in Fig. 1 which depicts the time-series of $Silliq_t$ from 31-12-2014 to 01-07-2020. The highest shocks in market illiquidity appeared in Fig. 1 coincide with challenges that were faced by the Saudi stock exchange. Indeed, by reviewing monthly reports of the Saudi Stock market, I discover that in July 2015, the number of shares traded fell by 26.3% from the previous month, and the number of transactions executed decreased by 25%. This explains the occurrence of the first high shock observed in 2015. I also find that in November 2018, the total number of stocks traded decreased by 30% and the total value of stocks traded fell by 35%. The peak in early 2020 coincides with the Coronavirus pandemic. The first quarter report of 2020 states a 26.24% fall in TASI value.

As specified in the methodology section, the first goal is to evaluate the sensitivity of SMEs returns to market illiquidity shocks. To do that, the parameters of Eq. 6 are estimated for each portfolio using the software EViews 10. Estimation results are summarized in Table 1.

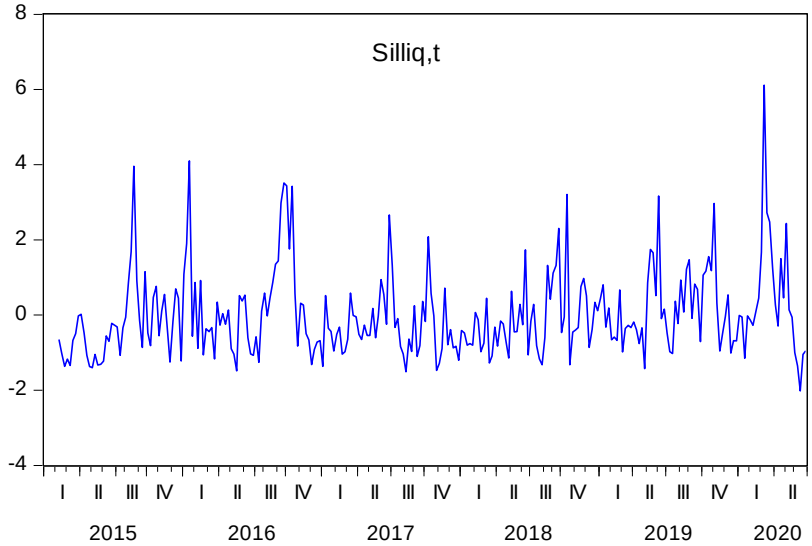

Fig. 1: Market illiquidity shocks on the Saudi stock exchange from 31/12/2014 to 01/07/2020

Table 1: Estimated parameters of Eq. 6 for the seven portfolios of industrial groups

Industrial groups	Coefficient	Estimates	p-value
Insurance	α	-0.596	0.018
	β_S	-1.457	0.000
Materials	α	-0.295	0.335
	β_S	-1.624	0.000
Real estate and development	α	-0.355	0.175
	β_S	-1.129	0.000
Capital goods	α	-0.447	0.140
	β_S	-1.195	0.000
Consumer services	α	-0.481	0.084
	β_S	-1.290	0.000
Foods and beverages	α	-0.483	0.080
	β_S	-1.617	0.000
Consumer durables and apparel	α	-0.463	0.091
	β_S	-1.638	0.000

Table 1 shows the estimated values of the coefficient β_S are negative and highly significant for all portfolios of SMEs. This indicates that SMEs' portfolio returns are negatively sensitive to market illiquidity shocks. In other words, market illiquidity shocks lower the prices of all SMEs on the Saudi stock exchange regardless of the industrial group to which the SME belongs. This corroborates the findings of Amihud (2019) on the New York Stock Exchange (NYSE) where the relation between illiquidity shocks and returns of common stocks is revealed as negative. Acharya et al. (2013) also found that market illiquidity shocks lower the returns of stocks and corporate bonds on the NYSE. Lee (2011) confirmed empirically the negative effect of illiquidity shocks internationally on stock returns. Bekaert et al. (2007) also confirmed the negative impact of illiquidity shocks on stocks returns of emerging markets by employing the "zero-return" ratio. "zero-return" ratio is also used by Ben Soltane et al. (2022) to confirm the negative relationship between stock returns and illiquidity shocks on the Tunisian stock exchange.

The second goal of this study is to test whether the negative relationship between SMEs' returns and illiquidity shocks differs according to the firm size. This is based on the second portfolio selection which is specified in the methodology section. The stock portfolio of Medium enterprises and the stock portfolio of Small enterprises computed by Eqs. 7 and 8, are described by the following statistics.

Table 2 indicates that both sized portfolios have average negative returns and approximately the same degree of variation measured by standard deviations of returns. Returns of small enterprise portfolios are slightly higher than those of medium enterprise portfolios. No large differences exist between both time-series returns. This is illustrated in the time-series graphs in Fig. 2.

Sensitivities of returns of both portfolios to the shocks of Saudi market illiquidity (illiquidity risks) are determined by estimating regressions 9 and 10. The results of estimations are summarized in Table 3.

Table 2: Descriptive statistics of portfolio returns of medium enterprises and small enterprises

	Mean	Med.	Max	Min	Standard deviation	Skewness	Kurtosis	Observation
R_{MED}	-0,48	-0.25	10.61	-21.52	4.01	-1.47	9.11	275
R_{Small}	-0.33	-0.21	12.01	-22.51	4.96	-1.02	7.09	275

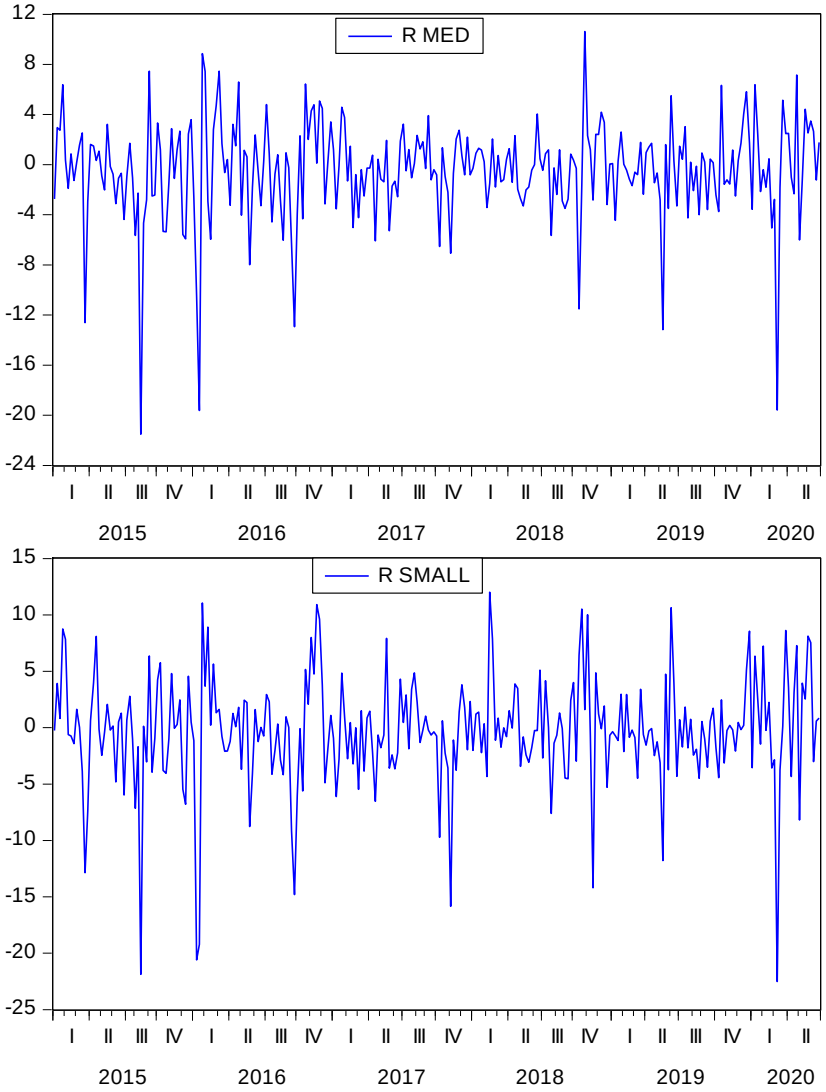

Fig. 2: Times-series returns evolutions of portfolio of medium enterprises (at the top) and portfolio of small enterprises (at the bottom), from 31/12/2014 to 01/07/2020.

Table 3: Estimation results of illiquidity-returns relationship for both sized-portfolios

Coefficient	Portfolio of medium enterprises		Portfolio of small enterprises	
	Estimates	t-stat	Estimates	t-stat
α	0.529	-2.367	-0.418	-1.475
β_S	-1.427	-7.301	-1.455	-5.871

Estimation results in Table 3 indicate that the estimated illiquidity risks of both sized portfolios are negative with strong statistical significance. Estimated illiquidity betas are similar for both portfolios. This proves that the negative relationship between SMEs' returns and illiquidity shocks does not differ between medium and large firms. This may be due to the lack of large statistical differences between the times-series returns of both portfolios.

4. Conclusion

I examine the over-time relationship between market illiquidity shocks and stock returns of SMEs that are listed on the Saudi stock exchange. The goal is to clarify the behavior of these enterprises toward illiquidity issues on the stock market. SMEs are the main pillar of Saudi Arabia's non-oil economy.

To measure the level of stock illiquidity, I use the price-impact ratio of Amihud (2002). I follow the methodology of Amihud (2002, 2019) to specify the autoregressive model that predicts the market illiquidity, and then to estimate the shocks of market illiquidity by innovations extracted from the autoregressive model. I found that estimated illiquidity shocks coincide with challenges that were experienced by the Saudi stock exchange. The relationship between SMEs' returns and market illiquidity shocks is revealed as negative regardless of the industrial group to which the SME belongs. This negative relationship has a high statistical significance. That means that market illiquidity shocks lower the contemporaneous SMEs' returns on the Saudi stock exchange. This corroborates the findings of Amihud (2019) and Acharya et al. (2013) on the NYSE where the relation between illiquidity shocks and returns of common stocks and U.S. bonds is revealed negative, as well as the results of Lee (2011) on a global level and the results of the

findings of Bekaert et al. (2007) and Ben Soltane et al. (2022) on emerging markets.

Furthermore, I test whether the resulting illiquidity-returns relationship depends on the size of firms, i.e., varies from medium to small enterprises. Earlier studies on U.S. data proved that the returns-illiquidity relationship is more negative for small capitalization than for large capitalizations. I sort stocks of SMEs into two portfolios according to the firm size i.e. portfolio of small enterprises and portfolio of medium enterprises. Estimation results reveal a negative and statistically significant sensitivity of both sized-portfolio returns to market illiquidity shocks. However, there are no large differences between illiquidity impacts on small enterprises and medium enterprises. This is explained by the lack of large statistical differences between the times-series returns of both portfolios.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Acharya VV, Amihud Y, and Bharath ST (2013). Liquidity risk of corporate bond returns: Conditional approach. Journal of Financial Economics, 110(2): 358-386. https://doi.org/10.1016/j.jfineco.2013.08.002

Alharbi RK (2022). Saudi Arabia's small and medium enterprises (SMEs) sector post-COVID-19 recovery: Stakeholders' perception on investment sustainability. International Journal of Organizational Analysis. https://doi.org/10.1108/IJOA-10-2021-2993

Allmnakrah A and Evers C (2020). The need for a fundamental shift in the Saudi education system: Implementing the Saudi Arabian economic vision 2030. Research in Education, 106(1): 22-40. https://doi.org/10.1177/0034523719851534

Amihud Y (2002). Illiquidity and stock returns: Cross-section and time-series effects. Journal of Financial Markets, 5(1): 31-56. https://doi.org/10.1016/S1386-4181(01)00024-6

Amihud Y (2019). Illiquidity and stock returns: A revisit. Critical Finance Review, 8: 203–221. https://doi.org/10.1561/104.00000073

Amihud Y and Noh J (2021). Illiquidity and stock returns II: Cross-section and time-series effects. The Review of Financial Studies, 34(4): 2101-2123. https://doi.org/10.1093/rfs/hhaa080

Bekaert G, Harvey CR, and Lundblad C (2007). Liquidity and expected returns: Lessons from emerging markets. The Review of Financial Studies, 20(6): 1783-1831. https://doi.org/10.1093/rfs/hhm030

Ben Soltane H and Naoui K (2021). Time-varying responses of stock returns to market illiquidity: Stress scenario with regime-switching framework. International Journal of Finance and Economics, 26(1): 1611-1622. https://doi.org/10.1002/ijfe.1866

Ben Soltane H, Naoui K, and Alshammari A (2022). Systematic illiquidity, characteristic illiquidity, and stock returns: Time series analysis. International Journal of Advanced and Applied Sciences, 9(2): 72-80. https://doi.org/10.21833/ijaas.2022.02.008

Lee KH (2011). The world price of liquidity risk. Journal of Financial Economics, 99(1): 136-161. https://doi.org/10.1016/j.jfineco.2010.08.003

Lesmond DA, Ogden JP, and Trzcinka CA (1999). A new estimate of transaction costs. The Review of Financial Studies, 12(5): 1113-1141. https://doi.org/10.1093/rfs/12.5.1113

Pástor Ľ and Stambaugh RF (2003). Liquidity risk and expected stock returns. Journal of Political Economy, 111(3): 642-685. https://doi.org/10.1086/374184

Watanabe A and Watanabe M (2008). Time-varying liquidity risk and the cross section of stock returns. The Review of Financial Studies, 21(6): 2449-2486. https://doi.org/10.1093/rfs/hhm054