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The Illiquidity Premium: Further Evidence from Global and Asia-Pacific Markets

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Abstract

We document the prevalence of illiquidity premium in the international equity markets, across 45 markets over the period from 1990 to 2015. The global average illiquidity premium is economically significant at 0.85% per month and it is 1.05% for the Asia-Pacific markets, after adjusting for exposure to global and regional return factors. We also find that investors demand a premium for stock illiquidity, after controlling for various firm characteristics that predict the cross-section of stock returns.

【Keywords】 illiquidity, illiquidity premium, international stock markets

1. Introduction

The basic tenet of asset pricing theories is that the expected return on equity is positively related to risk. Investors are averse to risk and hence demand larger premium for investing in riskier stocks. In these markets, securities with identical cash flows must have the same prices, reflecting the principle of the Law of One Price. These theories assume that stock trading is frictionless. However, in reality, the frictionless trading assumption rarely holds. Investors incur trading costs that rise when there is price impact that move prices. Stock illiquidity, which includes transaction costs and price impact of trading, is detrimental to investors as it reduces the net return after costs. Consequently, rational investors demand a higher expected return for investing in illiquid stocks. This is proposed by Amihud and Mendelson (1986). A great body of empirical work since then supports this proposition.[1]

Transaction costs are mainly due to inventory cost and asymmetric information. When a seller initiates a trade, buyers in the market would suspect that the seller may have negative information about the stock. They will agree to buy but only at a discount (Copeland and Galai, 1983; Glosten and Milgrom, 1985; Kyle, 1985). Market makers who buy the stock worry about the risk of holding the stock given its risk and the limits on their resources and therefore buy at a discount and sell at a premium, which gives rise to a bid-ask spread (Stoll, 1978; Amihud and Mendelson, 1980; Ho and Stoll, 1981).

Amihud and Mendelson (1986) propose that investors demand compensation for stock illiquidity. As a result, in equilibrium expected return is an increasing function of transaction costs. Evidence supporting this proposition is provided in Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), and Amihud (2002) for the US stock market. Recently, Amihud, Hameed, Kang, and Zhang (2015) present evidence of significant positive illiquidity return premium in global equity markets. Amihud et al. (2015) also show that there is a strong cross-country commonality in the illiquidity premium, which is different from commonality in illiquidity itself, found by Karolyi, Lee, and Van Dijk (2012).

This study extends the work of Amihud et al. (2015) in two ways. We use a longer sample period, from January 1990 to June 2015, to calculate the illiquidity premium in international stock markets. We specifically estimate the illiquidity premium in 16 Asia-

1 For a review, see Amihud, Mendelson, and Pedersen (2006, 2012).

Pacific markets and test whether this premium is different than it is in the rest of the world. We confirm the finding in Amihud et al. (2015) that the illiquidity premium is significantly positive across 45 markets for the extended sample period. The monthly illiquidity premium for each market is adjusted for exposure to three global and three regional factors comprising of market, size, and value factors. The monthly risk-adjusted global illiquidity premium – the intercept from this regression, denoted alpha – is economically significant at 0.85% (t-statistic = 7.53), using market indexes which constitute return-weighted average of the returns of the individual stocks in each market. The monthly premium is also larger (smaller) in emerging (developed) markets at 1.11% (0.66%) with a t-value of 7.97 (4.16). These numbers are comparable to those reported by Amihud et al. (2015).[2]

For the Asia-Pacific region, which includes 16 markets in our sample, the risk-adjusted return-weighted premium for illiquidity is highly significant at 1.05% per month (t = 6.05). The statistical and economic significance of the illiquidity premium is robust to alternative weighting methods such as volume weighting or market capitalization value weighting stocks within each market. After controlling for exposure to the six global and regional risk factors, the monthly illiquidity premium of the Asia-Pacific markets using volume-weighted (value-weighted) indexes is 0.92% (0.52%) with t = 4.19 (t = 3.59, respectively). The median estimates of the risk-adjusted illiquidity premium and non-parametric tests for significance support the robustness of the estimates. For example, the return-weighted risk-adjusted illiquidity premium is positive in 94% of the Asia-Pacific markets, and the proportion of markets with positive risk-adjusted premium is significantly higher than the chance result of 50%. Yet we find that the risk-adjusted illiquidity premium in the Asia-pacific market is not significantly different from the premium in the rest of the world.

We also employ an alternative approach to measuring the country specific premium for illiquidity using a cross-sectional regression framework. Specifically, for each market we employ the Fama and MacBeth (1973) method, regressing monthly stock returns on stock illiquidity after controlling for several firm characteristics that affect stock returns including size, book-to-market, volatility, and past returns. The risk premium is the mean

2 Amihud et al. (2015) find that the monthly illiquidity premium, adjusted for exposure to six global and regional factors, during the sample period from 1990 to 2011, is 0.82% (t = 7.07), 1.16% (t = 7.55), and 0.57% (t = 3.79) in the global, emerging, and developed markets, respectively.

coefficient in each country of the monthly cross-section coefficient of illiquidity. We find that stock illiquidity contributes positively and significantly to the prediction of future stock returns after controlling for other stock characteristics.

For the Asia-Pacific markets, the average across markets of the regression coefficient of illiquidity is positive and a highly significant 0.1 (t = 3.16) and it is positive in 88% of these 16 markets. Again, we find that the illiquidity premium in the Asia-Pacific markets is not significantly different than it is in the rest of the world.

In summary, this study reaffirms the existence of a significantly positive global illiquidity premium, observed in Amihud et al. (2015). We further show that the illiquidity premium is also positive in the Asia-Pacific region but it is not significantly different than it is in the rest of the world.

The paper proceeds as follows. Section 2 describes the data and introduces our main liquidity premium measure. Section 3 shows the existence of the global illiquidity premium, estimated using a portfolio sorting approach and a Fama-MacBeth regression approach. Section 4 concludes the paper.

2. Data and Methodology

2.1 Data

Our dataset covers 45 stock markets globally and the sample period is from January 1990 to June 2015. We follow the classification of markets into emerging and developed markets using the per capita gross national income series provided by the World Bank and used by Griffin, Kelly, and Nardari (2010). Markets are grouped into 19 emerging markets (Argentina, Bangladesh, Brazil, Chile, China, Egypt, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Romania, South Africa, Sri Lanka, Thailand, and Turkey) and 26 developed markets (Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Hong Kong, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, UK, and US). The Asia-Pacific group from among the 45 markets includes 16 markets: Australia, Bangladesh, China, Hong Kong, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, South Korea, Taiwan, and Thailand. In almost all markets, our sample contains all stocks traded on the main stock exchange. There are four exceptions where we select stocks traded on two active stock exchanges in a market. These four markets are China (Shanghai Stock

Exchange and Shenzhen Stock Exchange), Japan (Osaka Securities Exchange and Tokyo Stock Exchange), South Korea (Korea Stock Exchange and KOSDAQ) and US (NYSE and AMEX). For UK, we include only stocks traded in the order-driven market, which is the main trading platform where Datastream reports daily closing price using the last transaction price.

We retrieve daily stock price, trading volume, and shares outstanding data from the Center for Research in Security Prices (CRSP) for the US and from Thomson Reuters Datastream for the other 44 markets. We focus on ordinary stocks and exclude non-common stocks such as duplicates, American Depositary Receipts (ADRs), preferred stocks, warrants, bonds, exchange-traded funds (ETFs), Real Estate Investment Trusts (REITs), etc. We identify ordinary stocks in the US market using the CRSP share code 10 or 11. For the rest of the markets, we follow Griffin et al. (2010) and Amihud et al. (2015) to delete the non-ordinary stocks in Datastream. Our sample incudes both live and dead stocks in the sample period.

To deal with potential errors in the data from Datastream, we follow the methodology in Ince and Porter (2006) and Lee (2011). First, daily returns are set to be missing if they are above 200% or if they are greater than 100% but are substantially reversed in the follow day.[3] Second, daily returns are also set to be missing if the Return Index (RI), which is created by Datastream to control for stock splits and dividends, is below 0.01. Third, monthly returns are set to be missing if they are above 500% or if they are greater than 300% but are dramatically reversed in the following month. Fourth, daily volume is set to be missing if they are below 100 US dollars or if the daily share trading volume is larger than shares outstanding. Finally, we exclude days on which more than 90% of stocks in that market have zero returns. Daily local currency returns are converted to US dollar returns using daily exchange rates from Datastream.

2.2 The Illiquidity Measure

We measure stock illiquidity using the price impact measure based on the ratio of absolute stock returns per dollar of trading volume proposed in Amihud (2002). Specifically, the illiquidity of stock *i* in month *t*, $ILLIQ_{i,t}$, is defined as

3 To define a substantial reverse in daily return, we require $(1+r_{i,d})*(1+r_{i,d-1})-1 \leq 50\%$, where $r_{i,d}$ is the return of stock *i* on day *d* and at least either $r_{i,d}$ or $r_{i,d-1}$ is greater than 100%.

$$ILLIQ_{i,t} = \frac{1}{N_{i,t}} \sum_{d=1}^{N_{i,t}} \frac{|r_{i,d,t}|}{Dvol_{i,d,t}}$$

where $|r_{i,d,t}|$ is the absolute value of return on stock i on day d during month t, $Dvol_{i,d,t}$ is the trading volume in US dollars of stock i on day d, and $N_{i,t}$ is the number of trading days (with non-zero volume) during month t. *ILLIQ* is a low frequency measure of how much the price of a stock moves in response to a dollar of trading volume and can be viewed as the price impact of trading. *ILLIQ* is well suited as a measure of illiquidity in international stock market studies as it relies on only daily return and volume data, which are easily available for many markets. Importantly, *ILLIQ* is found to be strongly correlated with high frequency (intra-day) measures of price impact (Amihud, 2002; Hasbrouck, 2009; Goyenko, Holden, and Trzcinka, 2009; Fong, Holden, and Trzcinka, 2017). The illiquidity ratio has also been recently used in several other studies of commonality in illiquidity in international markets (Karolyi et al., 2012; Amihud et al., 2015).

We follow the method employed in Amihud et al. (2015) in constructing *ILLIQ*. For each stock in month t, $ILLIQ_{i,t}$ is calculated using daily return and volume data over a three-month period from t-3 to t-1. To ensure that there is adequate data to compute reliable estimate of *ILLIQ*, we apply several data filters. We require that the stocks have at least 10 valid (non-zero) trading volume days in the three-month period and at least three valid trading volume days in the last trading month t-1. The monetary value of stock trading volume is converted to US dollars using daily exchanges rates, and we exclude days that have trading volume below 100 US dollars. We also delete *ILLIQ* observations that belong to the extreme 1% in each month within each market/country. Finally, to be in the final sample, we require that there are at least 50 valid stocks satisfying all the above filters within a market for each month.[4]

4 Within each market, we delete months with less than 50 valid stock observations.

Table 1 Descriptive Statistics

The table presents the sample statistics. 'Starting year' is the year from which the data is available for each market. 'Number of months' is the number of months with valid observations during the sample period for each market. 'Average number of firms' and 'Total number of firms' are the average and total number of unique firms that satisfy the filter requirements. The market return is the value-weighted average of monthly stock return in US dollar. Market illiquidity is measured by the value-weighted average of the stocks' Amihud measure, which is the average ratio of daily absolute return to the daily trading volume over a 3-month period, rolling every month over the sample period. Both the daily return and the daily value of the trading volume are in US dollar. We report for the monthly time series of each country the mean, median, and standard deviation of market average return and illiquidity. The sample period is from January 1990 to June 2015. The markets are divided into 19 emerging markets and 26 developed markets, following the classification method of the World Bank and Griffin et al. (2010). The cross-market averages of each column are reported at the bottom for emerging, developed, global and Asia-Pacific markets.

					Market return (%)			Market illiquidity		
Market	Start	Number of months	Average number of firms	Total number of firms	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Argentina	1993	216	59	124	1.020	1.095	9.346	0.173	0.136	0.156
Bangladesh	1995	239	149	319	1.380	0.028	11.317	0.671	0.469	0.637
Brazil	1994	239	127	425	1.704	1.714	11.050	0.227	0.146	0.205
Chile	1990	302	113	284	1.004	0.856	8.471	0.141	0.119	0.108
China	1993	265	1,133	2,510	1.236	0.709	12.156	0.003	0.001	0.005
Egypt	1997	209	77	145	0.662	0.223	8.283	0.187	0.111	0.169
India	1995	237	893	3,302	0.471	0.877	10.300	3.028	2.458	1.923
Indonesia	1990	295	199	566	0.830	0.970	11.335	0.502	0.280	0.592
Malaysia	1990	302	604	1,050	0.859	1.153	8.954	0.123	0.080	0.126
Mexico	1990	289	79	303	0.902	1.569	8.478	0.126	0.079	0.162
Pakistan	1992	267	154	367	1.164	1.140	9.195	0.712	0.491	0.691
Peru	1994	157	63	206	0.941	0.573	7.982	0.229	0.165	0.253
Philippines	1991	290	132	304	1.017	0.961	8.519	0.476	0.393	0.385

					Market return (%)			Market illiquidity		
Market	Start	Number of months	Average number of firms	Total number of firms	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Poland	1998	204	226	988	0.409	-0.129	8.243	1.932	0.374	3.242
Romania	1997	103	61	147	-0.049	-0.868	11.262	2.324	0.786	2.697
South Africa	1990	302	292	885	0.908	0.744	7.286	0.110	0.084	0.081
Sri Lanka	1990	296	141	324	1.273	0.958	8.075	2.063	1.863	1.063
Thailand	1990	302	401	1,245	0.779	0.811	10.015	0.232	0.122	0.337
Turkey	1990	302	251	497	1.407	1.725	16.203	0.056	0.014	0.161
Australia	1990	302	981	2,925	0.905	1.345	6.410	0.090	0.080	0.052
Austria	1990	294	78	211	0.453	0.732	6.378	0.179	0.072	0.244
Belgium	1995	244	133	317	0.502	0.913	6.560	0.066	0.023	0.115
Canada	1990	302	900	2,633	0.849	0.953	5.426	0.078	0.055	0.076
Cyprus	1999	135	90	159	-1.078	-0.753	12.041	0.803	0.775	0.636
Denmark	1990	299	158	384	0.855	1.060	5.532	0.053	0.038	0.055
Finland	1997	221	121	215	1.078	1.212	7.039	0.060	0.030	0.080
France	1991	284	407	1,390	0.857	1.132	5.769	0.043	0.018	0.048
Germany	1993	199	650	1,459	0.609	0.844	5.916	0.076	0.066	0.045
Greece	1990	301	196	382	-0.777	-0.246	10.558	0.337	0.104	0.874
Hong Kong	1990	302	702	1,607	1.113	1.434	8.024	0.050	0.034	0.045
Israel	1993	266	383	788	0.500	0.718	8.120	0.617	0.236	0.908
Italy	1993	260	257	602	0.341	0.636	6.812	0.005	0.004	0.004
Japan	1990	302	2,208	3,482	0.200	0.087	5.875	0.010	0.007	0.012
Netherlands	1990	302	141	309	0.841	1.388	5.501	0.028	0.014	0.036
New Zealand	1992	273	99	279	1.127	1.345	6.128	0.120	0.105	0.067

Market	Start	Number of months	Average number of firms	Total number of firms	Market return (%)			Market illiquidity		
					Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Norway	1990	302	157	588	0.884	1.133	7.467	0.071	0.054	0.057
Portugal	1994	135	75	170	0.476	1.452	4.875	0.098	0.089	0.057
Singapore	1990	302	337	770	1.019	1.176	7.725	0.094	0.068	0.097
South Korea	1990	302	1,191	2,636	0.616	0.225	11.277	0.058	0.015	0.141
Spain	1990	301	121	276	0.434	0.499	6.630	0.118	0.008	0.236
Sweden	1990	302	330	1,190	1.096	1.246	7.182	0.039	0.023	0.046
Switzerland	1990	299	238	541	0.943	1.214	5.309	0.009	0.007	0.008
Taiwan	1991	287	554	995	0.506	0.499	8.369	0.004	0.003	0.005
UK	1990	302	1,022	3,765	0.864	1.097	5.332	0.007	0.005	0.008
US	1990	302	2,076	6,906	0.829	1.226	4.300	0.001	0.001	0.002
Emerging		253	271	736	0.943	0.795	9.814	0.701	0.430	0.684
Developed		274	523	1,345	0.617	0.868	6.944	0.120	0.074	0.152
Global		265	417	1,088	0.755	0.837	8.156	0.365	0.224	0.377
Asia-Pacific		285	617	1,418	0.906	0.857	8.980	0.515	0.404	0.386

After employing the above filters, we have 48,960 stocks and 5,328,712 stock months in our final sample. Table 1 reports the descriptive statistics for market level returns and illiquidity. The final sample consists of 45 markets with various sample periods across markets between 1990 and 2015. The average number of stocks per month in a market ranges between 59 (Argentina) and 2,208 (Japan). Consistent with prior empirical work, we find higher volatility of stock returns in emerging markets relative to developed markets. The monthly standard deviation of market returns averages 9.8% in emerging markets and 6.9% in developed markets. More volatile stock markets also have higher average market illiquidity. The time series mean (median) of market level *ILLIQ* is higher for emerging markets at 0.70 (0.43) compared with 0.12 (0.07) for developed markets. Among the Asia-Pacific markets, many exhibit high return volatility with average market volatility of 9.0%, and are relatively illiquid (average *ILLIQ* is 0.52). The most illiquid market in the sample is India with average *ILLIQ* of 3.0. There are two markets in the Asia-Pacific region that are relatively liquid based on *ILLIQ* measure: China and Taiwan. One possibility is that these markets are dominated by small (retail) traders who are uninformed. By Kyle's (1985) model, greater volatility of trading of uninformed investors reduces price impact and illiquidity.

3. Illiquidity Premium in International Markets

Following the analyses in Amihud et al. (2015) we use two approaches to estimate the illiquidity premium in international financial markets. The first approach involves constructing liquidity-sorted portfolios and estimating the illiquidity premium as the difference in returns on the high and low illiquidity portfolios, within each market. If liquidity is priced we expect illiquid portfolios to earn higher expected returns than liquid portfolios after adjusting for the differences in exposure to risk factors, producing a positive illiquidity premium. The second approach relies on estimating within market cross-sectional Fama-MacBeth regressions of individual stock returns on lagged stock illiquidity, controlling for other firm characteristics that may affect stock returns. A positive regression coefficient associated with illiquidity indicates a premium for illiquidity. We expand the sample period in Amihud et al. (2015) from 2011 to 2015, and find that adding four more years to the data does not qualitatively affect the main results. We find significant evidence of a positive premium for illiquidity in international stock markets.

3.1 Illiquidity Premium in Portfolio Returns

3.1.1 Construction of the Illiquidity Portfolios and Common Factors

We start by sorting all stocks in each market by their illiquidity (*ILLIQ*) and stock return volatility. Similar to the computation of *ILLIQ*, we calculate the return standard deviation using daily returns in a three-month period from *t*-3 to *t*-1. For each month *t*, we divide stocks within a market into three groups based on their volatility of daily returns. Then within each volatility portfolio, we further group stocks into five illiquidity portfolios based on *ILLIQ* in the same three-month period. Thus, we have 3x5 = 15 portfolios at the end of month *t*-1 in each market. We require each portfolio to have at least five stocks and the portfolios are rebalanced every three months. We skip month t and examine the average stock returns in each portfolio in month *t*+1 to *t*+3 in order to control for possible short-term return reversals associated with return volatility (Ang, Hodrick, Xing, and Zhang, 2009).

We use three weighting methods to calculate the portfolio returns: return-weighted average using stocks' prior-month gross return as the weight (Asparouhova, Bessembinder, and Kalcheva, 2010, 2013), value-weighted average using stocks' market capitalization at the end of the preceding month as the weight, and volume-weighted average using the US dollar trading volume over the portfolio formation period as the weight. Using these different weighting schemes establishes robustness of our findings on illiquidity premium to microstructure related biases in computing returns, relative weights on small and large stocks and a small free float in some stocks in which there are large blockholders. Lastly, we define the liquidity premium as the return difference between the high-*ILLIQ* portfolio and the low-*ILLIQ* portfolio which we denote *IML* – Illiquid-minus-liquid – both of which consist of three portfolios averaged across different levels of volatility.

The *IML* returns may be related to common risk factors. To obtain the risk-adjusted illiquidity premium, we construct global and regional factors of market, size-based and value-based returns. The global market factor is proxied by the return on the Morgan Stanley Capital International (MSCI) global equity index in excess of US 1-month T-Bill rate. For the global size and value factors, we first construct these factors within each market and then take a value-weighted average of market-level factors to construct the global factors. The size and value factors in each market are constructed in the same way as Fama and French (1993). Specifically, at the end of June in each year, stocks are divided into two size groups based on the median market capitalization. Also, stocks are

independently divided into three portfolios based on the breakpoints of the 30th and 70th percentiles of book-to-market ratio for all stocks with positive book value of equity, where the book value is for the end of the previous fiscal year whereas the market value is for the end of the previous calendar year. The country's size factor (SMB) is the difference of the value-weighted average returns between the small firm portfolio and the big firm portfolio, and the value factor (HML) is the difference between the value-weighted average returns of the two extreme BE/ME portfolios across the two size portfolios. All returns are in US dollar terms. We use the respective market's stock market capitalization in US dollars at the end of the previous month as the weight to aggregate the market level factor returns in order to construct the global risk factors.

To construct the regional market, size and value factors, we first group the 45 markets into three regions based on their geographical location: Asia-Pacific, America and Europe. Then each region is further divided into developed and emerging markets based on their economic development status measured by the per capita gross national income from the World Bank.[5] The regional market factor is the value-weighted average of each market's value-weighted market return in excess of the one-month US Treasury bill rate. The regional SMB and HML factors are constructed in two steps to control for the high correlation between the regional and corresponding global factors. First, we construct the value-weighted average of the country specific factor returns in each region. Second, we orthogonalize these regional factors against their respective global factors by using the residuals plus the intercept from a regression of the regional factor on the corresponding global factor.

Finally, we estimate the following regression to obtain the risk-adjusted illiquidity premium, $\alpha_{IML,c}$:

5 Markets are sub-divided into six regions as follows: (i) Asia-Pacific-developed markets (Australia, Hong Kong, Japan, New Zealand, Singapore, South Korea, and Taiwan); (ii) Asia-Pacific-emerging markets (Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Philippines, Romania, Sri Lanka, and Thailand); (iii) America-developed markets (Canada and US); (iv) America-emerging markets (Argentina, Brazil, Chile, Mexico and Peru); (v) Europe-developed markets (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Israel, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and UK); and (vi) Europe-emerging markets (Egypt, Poland, South Africa, and Turkey).

$$IML_{c,t} = \alpha_{IML,c} + \beta 1_c * GMR_t + \beta 2_c * GSMB_t + \beta 3_c * GHML_t + \beta 4_c * RMR_{c,t} + \beta 5_c * RSMB_{c,t} + \beta 6_c * RHML_{c,t} + e_{c,t}. \quad (1)$$

$IML_{c,t}$ is the illiquidity premium, defined as the return difference between the high- and low-*ILLIQ* portfolios (averaged across standard deviation groups), for country c in month t. GMR_t, $GSMB_t$, and $GHML_t$ are the returns on the global market, size and value factors, and $RMR_{c,t}$, $RSMB_{c,t}$, and $RHML_{c,t}$ are the return on the regional market, size and value factors, respectively.[6] The intercept in equation (1), $\alpha_{IML,c}$, measures the risk-adjusted return premium of illiquidity.

3.1.2 Illiquidity Premium Based on Illiquidity Sorted Portfolios Returns

For each market, we estimate the illiquidity premium, IML_c, and risk-adjusted illiquidity premium, $\alpha_{IML,c}$, and report the average illiquidity premium for all markets, and sub-groups of emerging, developed, and Asia-Pacific countries. As shown in Table 2, we find substantial international evidence of a significant premium for stock illiquidity. When stocks within each country are return-weighted, the global average monthly IML_c is a large 0.72% (t = 6.69). The median IML_c is about the same at 0.81%, suggesting that the mean values are not affected by outliers. The illiquidity premium is also not explained by the portfolio exposure to global and regional common factors. The global average risk-adjusted illiquidity premium $\alpha_{IML,c}$ is also economically significant at 0.85% per month (t = 7.53). Across the 45 markets, a large percentage (89%) of the markets have positive $\alpha_{IML,c}$. We can soundly reject the possibility that the positive illiquidity premium we observe in the global stock market is due to chance with p-value which is below 0.001. Hence, there is significant evidence that investors care about stock market illiquidity and require compensation for investing in illiquid securities.

We also report the average illiquidity premium within emerging and developed markets. Table 2 reveals that IML_c and $\alpha_{IML,c}$ are significantly positive for both emerging and developed markets, with larger premium for illiquidity in emerging markets. For example, the return-weighted $\alpha_{IML,c}$ is a 0.66% per month (t = 4.16) in developed markets and increases to 1.11% per month (t = 7.97) in emerging markets. The differences in the median values of $\alpha_{IML,c}$ is more striking, with 0.37% for developed markets and 1.18% for

6 The regional factors have a subscript of c as different markets belong to different regions.

emerging markets. It follows that investors in emerging markets require a higher compensation for illiquidity, partly reflecting the observation in Table 1 that the emerging markets are also more illiquid.

Finally, we report the $\alpha_{IML,c}$ averaged across the 16 Asia-Pacific markets. Here too we find strong evidence for a positive return premium for illiquidity: the return-weighted $\alpha_{IML,c}$ is both statistically and economically significant at 1.05% per month (t = 6.05). The point estimate of $\alpha_{IML,c}$ for the Asia-Pacific markets are closer to that for emerging markets, emphasizing that the illiquidity premium in Asia-Pacific markets are relatively high and close to that in emerging markets worldwide.

The above findings are highly robust. We repeat the estimation of IML_c and $\alpha_{IML,c}$ using the other two alternative weighting schemes, where stocks in the portfolios are either weighted by their market capitalization (value-weighted) or trading volume in the previous period (volume-weighted). Table 2 shows that the main findings on the positive premium for illiquidity worldwide and within emerging, developed and Asia-Pacific sub-groups remain intact when we employ different weighting schemes. The point estimate of the global volume-weighted average $\alpha_{IML,c}$ is significant at 0.77% per month (t = 6.2) and is very close to that reported using return-weights. We reach a similar conclusion when $\alpha_{IML,c}$ is estimated by averaging across the emerging, developed and Asian markets. When we apply value-weights, which overemphasizes larger firms, the global average $\alpha_{IML,c}$ continues to be significant and all the relative assessments remain unchanged, although the magnitude is smaller. For example, the value-weighted $\alpha_{IML,c}$ for global, emerging, developed and Asia-Pacific markets are 0.5% (t = 5.2), 0.69% (t = 4.7), 0.37% (t = 2.95) and 0.52% (t = 3.59) respectively (see Table 2). We also reach similar conclusions based on the non-parametric tests of the percentage of positive $\alpha_{IML,c}$. Overall, the differential returns on the portfolio of illiquid and liquid stocks suggest that there is an economically significant premium for illiquidity.

Table 2 Evidence of the Illiquidity Premium – Portfolio Analysis

This table summarizes the results on illiquidity premiums, measured by the average monthly return on illiquid-minus-liquid stock portfolios (*IML*). For each market, stocks are first sorted at the beginning of month *t* into three portfolios by the standard deviation of their daily return over the three-month period from month *t*-3 to *t*-1. Within each volatility portfolio, stocks are sorted into five equal portfolios based on their Amihud (2002) illiquidity measure calculated over the same three-month period. For each of the double-sorted portfolios we calculate the monthly portfolio average return using three averaging methods: return-weighting (using the stock's return at the end of the previous month), value-weighting (using the stock's market capitalization at the end of the previous month) and volume-weighting (using the monetary value of stock's trading volume in the portfolio formation period). All returns are adjusted to be in terms of US dollars. After portfolio construction, returns are calculated for months *t*+1, *t*+2 and *t*+3, and the portfolio formation is repeated every three months. The liquid (illiquid) stock portfolio return is the average of the portfolio returns on the three most (least) liquid portfolios across the three volatility-sorted portfolios. IML_c is the illiquid-minus-liquid portfolio return of country *c*. $\alpha_{IML,c}$ is the risk-adjusted excess return on the illiquid-minus-liquid portfolio, obtained as the intercept from a regression of $IML_{c,t}$ on global and regional common risk factors, following Fama and French (1993). The mean of $IML_{c,t}$ and the intercept $\alpha_{IML,c}$ are calculated for each country, and the cross-country statistics of these variables are presented. The *t*-statistics for the cross-country averages are in parentheses. The *p*-value is the significance level of the test that the values of IML_c or $\alpha_{IML,c}$ are equally likely to be positive or negative (i.e., probability of 50%).

	Return-weighted Method		Value-weighted Method		Volume-weighted Method	
	IML_c	α_{IMLc}	IML_c	α_{IMLc}	IML_c	α_{IMLc}
Emerging Markets (19 countries)						
Mean	1.034	1.109	0.766	0.690	0.941	0.872
(*t*-statistic)	(9.79)	(7.97)	(6.77)	(4.70)	(6.45)	(4.43)
Median	1.036	1.181	0.745	0.667	0.743	0.795
% positive	100.0%	94.7%	94.7%	89.5%	100.0%	84.2%
p-value	0.000	0.000	0.000	0.000	0.000	0.002
Developed Markets (26 countries)						
Mean	0.492	0.655	0.187	0.368	0.542	0.691
(*t*-statistic)	(3.14)	(4.16)	(1.63)	(2.95)	(3.67)	(4.33)
Median	0.286	0.371	0.152	0.102	0.389	0.367
% positive	65.4%	84.6%	61.5%	73.1%	80.8%	84.6%
p-value	0.084	0.000	0.163	0.014	0.001	0.000
Global Markets (all 45 countries)						
Mean	0.721	0.847	0.432	0.504	0.711	0.768
(*t*-statistic)	(6.69)	(7.53)	(4.71)	(5.20)	(6.56)	(6.22)
Median	0.811	0.835	0.591	0.400	0.684	0.526
% positive	80.0%	88.9%	75.6%	80.0%	88.9%	84.4%
p-value	0.000	0.000	0.000	0.000	0.000	0.000

	Return-weighted Method		Value-weighted Method		Volume-weighted Method	
	IML_c	α_{IMLc}	IML_c	α_{IMLc}	IML_c	α_{IMLc}
Asia-Pacific Markets (16 countries)						
Mean	1.110	1.046	0.715	0.521	1.081	0.920
(*t*-statistic)	(6.95)	(6.05)	(5.91)	(3.59)	(5.87)	(4.19)
Median	1.014	1.029	0.656	0.573	0.937	0.773
% positive	100.0%	93.8%	100.0%	87.5%	100.0%	81.3%
p-value	0.000	0.000	0.000	0.002	0.000	0.011

We formally test whether the illiquidity risk-adjusted premium *alpha* in the Asia-Pacific markets is significantly different from that in the rest of the world, controlling for the type of market (emerging versus developed). We estimate the following model:

$$\alpha_{IMLc} = a0 + a1*\text{DUM-ASIAPAC}_c + a2*\text{DUM-EMERGE}_c$$

In this regression, $\text{DUM-ASIAPAC}_c = 1$ if the market is among the Asia-Pacific markets (zero otherwise) and $\text{DUM-EMERGE}_c = 1$ if the market is an emerging one (zero otherwise). The regression has 45 observations for the 45 markets. We estimate this regression for the three methods of return weighting. We find the following results (in parentheses are the *t*-statistics).

For return-weighted returns:

$a0 = 0.596$ (3.82), $a1 = 0.219$ (0.95), $a2 = 0.409$ (1.82). $R^2 = 0.11$.

For value-weighted returns:

$a0 = 0.380$ (2.76), $a1 = -0.046$ (-0.22), $a2 = 0.331$ (1.66). $R^2 = 0.06$.

For volume-weighted returns:

$a0 = 0.636$ (3.55), $a1 = 0.206$ (0.77), $a2 = 0.138$ (0.54). $R^2 = 0.03$.

The evidence shows that the risk-adjusted illiquidity premium in the Asia-Pacific markets is not significantly different from that in the rest of the world. The coefficient *a1* is not significantly different from zero in all three regressions. In unreported results, we also find that the risk-adjusted illiquidity premium in a smaller set of seven markets in South-East Asia (namely, Hong Kong, Indonesia, Malaysia, Philippines, Singapore, Taiwan, and Thailand) is similarly positive and not significantly different from the rest of the world.

3.2 The Premium for Illiquidity, Estimated Using Cross-Sectional Regressions

Our second approach to estimating the illiquidity premium is to run Fama-MacBeth cross-sectional regressions of stock returns on stock illiquidity and other firm characteristics. Specifically, we estimate the following model:

$$R_{c,j,t} = b0_{c,t} + b1_{c,t}*ILLIQ_{c,j,t-2} + b2_{c,t}*SIZE_{c,j,t-2} + b3_{c,t}*B/M_{c,j,t-n} + b4_{c,t}*SD_{c,j,t-2} + b5_{c,t}*R_{c,j,t-2-4} + b6_{c,t}*R_{c,j,t-5-13} + e_{c,j,t} \quad (2)$$

$R_{c,j,t}$ is the (percent) return on stock j in month t for market c; and $ILLIQ_{c,j,t-2}$ is the stock j's mean-adjusted *ILLIQ* ratio calculated using the daily return and volume data in the three-month period from month t-4 to t-2. We use the mean value of *ILLIQ* in each month across all stocks within a market to scale the raw *ILLIQ* so that stock illiquidity is standardized over time within each market. In equation (2), we control for other firm characteristics that have been shown to predict stock returns including (i) $SIZE_{c,j,t-2}$, the logarithm of the stock market capitalization, calculated at the end of month t-2; (ii) $B/M_{c,j,t-n}$ is the lagged book-to-market ratio which is known at the beginning of month t, calculated in accordance with the procedure in Fama and French (1993); (iii) $SD_{c,j,t-2}$ is the logarithm of the standard deviation of stock returns calculated using daily returns over months t-4 to t-2; (iv) $R_{c,j,t-2-4}$ ($R_{c,j,t-5-13}$) are the lagged returns (in decimals) over the preceding three (nine) months from t-4 to t-2 (t-13 to t-5) to capture the price momentum effect (Jegadeesh and Titman, 1993). We estimate equation (2) in each month within each market using the return-weighted method proposed by Asparouhova et al. (2010) and obtain the time-series average of the estimated coefficients. We have 44 markets in the final sample (excluding Romania), as we require each market to have at least 30 non-missing values of the explanatory variables and at least 36 monthly regressions.

Table 3 Evidence of the Illiquidity Premium – Fama-MacBeth Regression Analysis

The table reports the summary of the estimated coefficients of the following cross-sectional regression model:

$$R_{c,j,t} = b0_{c,t} + b1_{c,t}*ILLIQ_{c,j,t-2} + b2_{c,t}*SIZE_{c,j,t-2} + b3_{c,t}*B/M_{c,j,t-n} + b4_{c,t}*logSD_{c,j,t-2} + b5_{c,t}*R_{c,j,t-2-4} + b6_{c,t}*R_{c,j,t-5-13} + e_{c,j,t}$$

$R_{j,t}$ is the return of stock j in month t; $ILLIQ_{j,t-2}$ is the Amihud illiquidity measure which is mean-adjusted for the country in each month, thus providing a standardized measure of illiquidity for all countries and over time; $SIZE_{j,t-2}$ is the log value of the market capitalization of firm j; $B/M_{j,t-n}$ is the lagged book-to-market ratio known in month t, following the procedure of Fama and French (1993); log$SD_{j,t-2}$ is the stock j's daily return standard deviation; $R_{j,t-2-4}$ and $R_{j,t-5-13}$ are the stock's lagged returns during t-2 to t-4 and t-5 to t-13 respectively. *Amihud* and *SD* are calculated over a rolling window of three months, then we skip one month and the model is estimated for each month. All variables are in US dollars. The regressions are estimated for each of the 44 countries, and are return-weighted to reduce potential bias, following Asparouhova et al. (2010, 2013). The mean coefficient is calculated for each country *c* following the Fama-MacBeth (1973) procedure. The table reports the statistics of the country mean coefficients across the 44 countries. The associated *t*-statistics are included in parenthesis. The *p*-value is the significance level of the test for the null hypothesis that across countries, the mean values of the coefficient estimates are equally likely to be positive or negative (i.e., probability of 50%).

Market	*constant*	*ILLIQ*	*SIZE*	*B/M*	*logSD*	$R_{j,t-2-4}$	$R_{j,t-5-13}$	R^2
Emerging Markets (18 countries)								
Mean	4.647	0.086	-0.286	0.304	-0.629	0.007	0.003	15.0%
(*t*-statistic)	(4.60)	(2.61)	(-3.91)	(1.79)	(-4.17)	(2.78)	(2.70)	
Median	3.964	0.076	-0.203	0.271	-0.622	0.011	0.002	13.2%
% positive	94.4%	83.3%	11.1%	83.3%	11.1%	72.2%	66.7%	
p-value	0.000	0.004	1.000	0.004	1.000	0.048	0.119	
Developed Markets (26 countries)								
Mean	2.051	0.077	-0.103	0.300	-0.553	0.018	0.008	12.0%
(*t*-statistic)	(5.58)	(4.17)	(-3.89)	(5.89)	(-7.32)	(8.49)	(7.64)	
Median	1.688	0.067	-0.072	0.239	-0.488	0.019	0.008	11.6%
% positive	92.3%	88.5%	23.1%	92.3%	7.7%	96.2%	92.3%	
p-value	0.000	0.000	0.999	0.000	1.000	0.000	0.000	
Global Markets (all 44 countries)								
Mean	3.113	0.081	-0.178	0.302	-0.584	0.014	0.006	13.2%
(*t*-statistic)	(6.24)	(4.71)	(-4.94)	(4.05)	(-7.76)	(7.50)	(7.04)	
Median	2.146	0.070	-0.107	0.262	-0.546	0.014	0.006	12.1%
% positive	93.2%	86.4%	18.2%	88.6%	9.1%	86.4%	81.8%	
p-value	0.000	0.000	1.000	0.000	1.000	0.000	0.000	

Market	*constant*	*ILLIQ*	*SIZE*	*B/M*	*logSD*	$R_{j,t-2-4}$	$R_{j,t-5-13}$	R^2
Asia-Pacific Markets (16 countries)								
Mean	4.760	0.099	-0.298	332.171	-0.760	0.007	0.002	11.9%
(*t*-statistic)	(4.65)	(3.16)	(-4.15)	(1.81)	(-6.38)	(2.87)	(1.88)	
Median	4.569	0.093	-0.278	278.415	-0.675	0.006	0.002	10.7%
% positive	100.0%	87.5%	0.0%	93.8%	0.0%	75.0%	68.8%	
p-value	0.000	0.002	1.000	0.000	1.000	0.038	0.105	

Table 3 presents the cross-market average values of the regression coefficients in equation (2). All firm characteristics in equation (2) (i.e., size, book-to-market, volatility, and past returns) show up as significant predictors of stock returns. Consistent with prior literature, we find that stocks of smaller firms, stocks with less volatile return, stocks of value firms and stocks of past winners earn higher future returns. The findings hold for the global sample as well as for the three sub-groups corresponding to emerging, developed, and Asia-Pacific markets.

Importantly, we find that stock returns are positively related to stock illiquidity in international markets, after controlling for the effects of the above stock characteristics. For the sample of all 44 markets, the estimated coefficient of *ILLIQ* averages to a significant 0.081 (t = 4.71). The median value of the regression coefficient is similar at 0.07. We also find that about 86% of the coefficients associated with *ILLIQ* are positive, which rejects the null hypothesis that the positive coefficients are due to chance (p-value < 0.001). Significant evidence on a positive illiquidity premium is also present in all three sub-groups. As shown in Table 3, the average regression coefficient is positive and significant in the subgroups of emerging markets, developed markets and Asia-Pacific markets at 0.086 (t = 2.61), 0.077 (t = 4.17), and 0.099 (t = 3.16) respectively.

Using the coefficient $b1_c$ of lagged illiquidity as a measure of the illiquidity premium, we replicate the estimation above to test whether the illiquidity premium thus estimated differs significantly between the Asia-Pacific markets and the rest of the world. Specifically, we regress $b1_c$ on the two dummy variables defined above:

$$b1_c = a0 + a1*\text{DUM-ASIAPAC}_c + a2*\text{DUM-EMERGE}_c$$

We find the following results (in parentheses are the t-statistics):

$a0$ = 0.069 (2.80), $a1$ = 0.028 (0.76), $a2$ = 0.003 (0.07) R^2 = 0.02.

Similar to the results based on α_{IMLc}, we find that the coefficient *a1* of DUM-ASIAPAC$_c$ is not significantly different from zero.

To summarize, the analyses based on portfolios formed on illiquidity sorting and the cross-sectional regressions of individual stock returns on illiquidity produce remarkably consistent results. Overall, we find compelling evidence that investors demand a higher return premium for less liquid stocks in the international stock markets.

4. Conclusion

In this study we document strong evidence of a positive and economically significant illiquidity premium in the international equity markets during the period from 1990 to 2015, which supports our earlier evidence in Amihud et al. (2015). The global illiquidity premium is a large 0.72% per month based on difference in the returns on the illiquid and liquid portfolios. This premium is not explained by exposure to global and regional risk factors. The risk-adjusted illiquidity premium is significantly positive at 0.85% per month. We find similar evidence for Asia-Pacific markets: the monthly risk-adjusted illiquidity premium is an economically large 1.05%. Our findings are economically meaningful in that they suggest that corporate managers as well as policy-makers and regulators should endeavour to improve stock illiquidity. Improvements in liquidity lower the illiquidity premium demanded by the investors, thereby reducing the cost of capital incurred by corporations when they raise funds in the stock market.

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