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The illiquidity premium: International evidence ☆

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A B S T R A C T

We examine the illiquidity premium in stock markets across 45 countries and present two findings. First, the average illiquidity return premium across countries is positive and significant, after controlling for other pricing factors. The premium is measured by monthly return series on illiquid-minus-liquid stocks or by the coefficient of stock illiquidity estimated from cross section Fama-MacBeth regressions. Second, a commonality exists across countries in the illiquidity return premium, controlling for common global return factors and variation in global illiquidity. This commonality is different from commonality in illiquidity itself and is greater in globally integrated markets.

1. Introduction

Liquidity is valuable to investors: they demand a return premium to compensate for asset illiquidity (see Amihud and Mendelson, 1986). The supporting evidence, however, is US-centric. This paper is the first to study the illiquidity premium across the world. Consistent with theory, we find in a sample of 45 countries that the illiquidity return premium is positive after controlling for risk factors and firm characteristics. We also show the existence of *commonality in the illiquidity return premium*. A country's illiquidity premium co-varies positively and significantly with the global and regional illiquidity premiums, after controlling for common risk factors at the global and regional level. This commonality in the illiquidity return premium is distinct from the well-established commonality in illiquidity itself.

The pricing of illiquidity is estimated in two ways. One measure of illiquidity return premium is the differential return between the most illiquid and the least illiquid stock quintile portfolios, denoted as *IML*, the illiquid-minus-liquid portfolio return.[1] We find that, across countries, the average monthly *IML* is 0.80% (0.49%) for average portfolio return that is equally return-weighted

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[1] This is analogous, for example, to the HML (high-minus-low book-to-market) factor of Fama and French (1993), which they use to test whether the book-to-market ratio is a priced stock characteristic.

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(value-weighted).[2] The risk-adjusted illiquidity premium, α_{IML}, is, respectively, 0.82% or 0.45% after controlling for six common global and regional risk factors, and it is higher for emerging markets compared with developed ones. We also employ volume-weighted *IML* because ownership concentration in many countries makes the float small relative to market capitalization. For volume-weighted average returns, the mean *IML* is 0.75% and α_{IML} is 0.73%. We observe that α_{IML} is positive in 84% of the countries for equally return-weighted returns (67% and 80% for value- and volume-weighted returns, respectively), significantly higher than the chance result of 50%. Altogether, illiquidity is positively and significantly priced around the world.

We also use the relative illiquidity premium (*RIML*) to account for relative illiquidity differential between countries and over time. *RIML* is the illiquidity return premium (*IML*) per 1% spread in illiquidity between the high and low illiquidity portfolios. For *RIML*, too, the risk-adjusted mean is positive and significant.

The second measure of illiquidity premium is the mean coefficient (denoted $b1$) from cross section monthly regressions of stock returns on lagged stock illiquidity, following Amihud and Mendelson (1986), Amihud (2002), and others, controlling for firm characteristics [size, equity book-to-market ratio (BE/ME), volatility, and past return]. The mean $b1$ is calculated for each country and then averaged across countries. We find that the cross-country average of mean $b1$ is positive and significant.

We introduce a new type of commonality: Across countries, illiquidity return premiums (or, the price of illiquidity) co-vary positively with the global and regional illiquidity premiums after controlling for global and regional common risk factors. The commonality in illiquidity return premiums is robust across the measures of the premium employed in this study. It exists for monthly series of *IML*, *RIML*, and $b1$. Our analysis differs from that of Brockman, Chung, and Perignon (2009), who study the commonality in global (il)liquidity level (bid-ask spread and depth), following the work by Chordia, Roll, and Subrahmanyam (2000) on liquidity commonality in the US.[3] Lee (2011) studies the pricing of systematic risk of shocks in global illiquidity, following the Acharya and Pedersen (2005) study for the US. The commonality that we introduce is different. It is in the illiquidity return premium across markets, not in the level of illiquidity. Our evidence shows that the cross-country commonality in illiquidity return premium is positively and significantly associated with the commonality in the price of illiquidity, but not with the commonality in illiquidity itself. We also find that the commonality in illiquidity return premium remains highly significant after controlling for global illiquidity whose effect on the illiquidity return premiums is very small and mostly insignificant. This shows that the commonality in illiquidity return premium is economically distinct from the commonality in illiquidity characteristic.

We find that the commonality in illiquidity return premium is higher in markets that are more open to foreign investors and more integrated with the global financial market. We also find that an exogenous event — the introduction of the euro as common currency among some European countries — increased the commonality in illiquidity return premium among the countries that adopted the Euro, controlling for the effect of the regional market returns on the illiquidity premiums. Our findings thus suggest that while open markets facilitate financial integration, they also increase domestic investors' exposure to global shocks in illiquidity premiums. Investors' ability to diversify against liquidity shocks is therefore reduced because of stronger co-movement in illiquidity premiums across open markets.

Our paper is the first to study globally the effect on expected return of the stock illiquidity as characteristic (the illiquidity level), which is different from the effect of illiquidity risk (illiquidity beta). The difference between the two approaches, the pricing of stock characteristic versus the pricing of the risk of those characteristics, is discussed by Daniel and Titman (1997). For the US, the effect of illiquidity as characteristic has been studied by Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), and Amihud (2002), and the illiquidity risk effect by Pastor and Stambaugh (2003) and Acharya and Pedersen (2005).[4] Whereas the pricing of illiquidity risk is studied globally by Lee (2011), a global study of the effect of illiquidity as characteristic has not hitherto been done. For the US, the premium for liquidity as characteristic has been found to be higher than the illiquidity risk premium (see Hagströmer, Hansson, and Nilsson, 2013). In another strand of research on the global return-liquidity relation, Bekaert, Harvey, and Lundblad (2007) study the time series relation between market liquidity shocks and market returns, following Amihud (2002). They find that "unexpected liquidity shocks are positively correlated with contemporaneous return shocks" (p. 1783).

The paper proceeds as follows. In Section 2, we describe the procedure of estimating the illiquidity premium across countries, and in Section 3, we present the estimates of the illiquidity premiums for the 45 countries in our sample. Section 4 presents evidence on commonality in illiquidity return premium and how it is affected by market openness and by increased integration between markets. We offer concluding remarks in Section 5.

2. Data and methodology

2.1. Sample construction

Our sample includes 45 markets with data over 22 years, from 1990 to 2011. Data on stock prices, shares outstanding, and trading volume for all countries except

[2] This method modifies the equally weighted mean to correct for potential bias resulting from microstructure noise, following Asparouhova, Bessembinder, and Kalcheva (2010, 2013).

[3] Karolyi, Lee, and van Dijk (2012) find illiquidity commonality within countries around the world.

[4] For a review of the studies of the positive cross section relation between lagged illiquidity and expected return, see Amihud, Mendelson, and Pedersen (2013).

for the US are obtained from Datastream. US data are obtained from the Center for Research in Security Prices (CRSP) for the NYSE and AMEX markets. We include only common (ordinary) stocks. For the US data, we restrict the sample to common shares defined by the CRSP share code 10 or 11. For the other markets, we use the following procedure to identify common stocks in Datastream. We download only securities that are identified as equity, are listed as "primary quote" in the main exchange(s) in each country, and are traded in local currency (includes euro for markets in the Eurozone). We follow Griffin, Kelly, and Nardari (2010) in using common and country-specific filters to delete non-common stocks such as duplicates, American Depositary Receipts (ADRs), preferred stocks, warrants, bonds, exchange-traded funds (ETFs), Real Estate Investment Trusts (REITs), etc, identified by the special terms in firm names.[5] We use one main stock exchange in all markets, with three exceptions: Shanghai Stock Exchange and Shenzhen Stock Exchange in China, Osaka Securities Exchange and Tokyo Stock Exchange in Japan, and Korea Stock Exchange and KOSDAQ in South Korea. For these three countries, most stocks are listed in only one of two exchanges. We eliminate stocks that are listed in both exchanges. In the US, we use the NYSE and AMEX markets, following Amihud (2002).[6]

The 45 sample markets are split into 19 emerging and 26 developed markets, following the classification of per capita gross national income by the World Bank and by Griffin, Kelly, and Nardari (2010). The 45 markets span three geographical regions: Americas (7), Asia-Pacific (16), and Europe (22, which include two African and two Asian markets that are related to Europe). Emerging markets contain five American markets (Argentina, Brazil, Chile, Mexico, Peru), nine Asia-Pacific markets (Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand), and five European markets (Egypt, Poland, Romania, South Africa, Turkey). The developed markets have two American markets (Canada, US), seven Asia-Pacific markets (Australia, Hong Kong, Japan, New Zealand, Singapore, South Korea, Taiwan), and 17 European markets (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Israel, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom). The sample includes stocks that ceased to exist during the sample period.

To reduce the influence of data errors in Datastream, we apply several filters following the method of Ince and Porter (2006) and Lee (2011). Daily returns from Datastream are set as missing if they are greater than 200% or if $(1+r_{i,d})*(1+r_{i,d-1})$-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%. Similarly, monthly returns are set as missing if they are above 500% or they are above 300% and are reversed within the following month. Datastream reports the stock return index (RI), which controls for stock splits and dividends to the nearest hundredths. Consequently, stock returns computed from the RI measure could round very small returns to zero values. To avoid potential rounding errors, we set daily return to be missing if the RI is less than 0.01. In addition, we delete stocks with daily share trading volume larger than total shares outstanding. Daily volume is set to be missing if it is lower than one hundred US dollars. Finally, we exclude in any market days on which more than 90% of stocks have zero returns. For the UK, we include only stocks traded in the order-driven market, which is the main trading platform and in which Datastream's daily closing price follows the convention of being the last transaction price as it is in CRSP.[7]

2.2. Measuring illiquidity

We use the Amihud (2002) illiquidity measure *Illiq*, which reflects the price impact of a monetary unit of trade as a coarse proxy of the Kyle (1985) price impact measure of illiquidity (λ). Fong, Holden, and Trzcinka (2011) find that, across countries, *Illiq* is highly and significantly correlated with the Kyle (1985) price impact measure, consistent with earlier findings for the US by Amihud (2002), Hasbrouck (2009), and Goyenko, Holden, and Trzcinka (2009).[8] *Illiq* is also used in the estimation of illiquidity risk by Acharya and Pedersen (2005) and to study asset liquidity commonality in international setting by Karolyi, Lee, and van Dijk (2012). *Illiq* is defined as

$$Illiq_{i,t} = (1/N_{it})\Sigma_d(|r_{i,d,t}|/vol_{i,d,t}). \quad (1)$$

$|r_{i,d,t}|$ is the absolute value of return on stock i on day d in period t, $vol_{i,d,t}$ is the trading volume in US dollars of stock i on day d, obtained by multiplying the number of shares traded by the closing price, and $N_{i,t}$ is the number of trading days (with nonzero volume) for stock i in period t.

We calculate $Illiq_{i,t}$ for each stock i based on daily data over a non-overlapping three-month moving window from months $t-3$ to $t-1$. To be included in a portfolio in the period that follows, stocks should satisfy the following requirements. A stock should have at least ten valid daily observations (return and

[5] A detailed list of the special terms in firm names is in Appendix Table B in Griffin, Kelly, and Nardari (2010).

[6] Because trading on Nasdaq was mainly through market makers in the early part of the sample, trading volume was double counted. Then, *Illiq* would not be comparable on NYSE and AMEX and on Nasdaq. The separation of NYSE and AMEX from Nasdaq is also done in Brennan, Huh, and Subrahmanyam (2013).

[7] In contrast, in the quote-driven segments of the market, the reported daily closing prices are the midpoint of the quoted bid and ask prices, not transaction prices. Datastream kindly provided us with the classification of UK stocks into the two trading platforms. Stocks traded in the quote-driven segments of the UK market had an abnormally large proportion of days that had zero return and positive trading volume. That is, trading took place within a wide bid-ask spread and the recorded price was the midpoint. Lee (2011), who notes this problem with UK data, resolves it by excluding stocks with a high proportion of zero returns and positive volume. Datastream reported to us that there is no such problem in other markets in our sample.

[8] Lesmond (2005) uses data from emerging markets to study the relation between stocks' bid-ask spread and illiquidity measures obtained from daily data on returns and volume. He finds that two illiquidity measures perform best, those of Lesmond, Ogden, and Trzcinka (1999) and of Amihud (2002).

Table 1
Descriptive statistics.

The table presents the sample statistics. "Starting year" is the year from which the data are 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" is the average number of firms in each month, and "Total number of firms" is the total number of unique firms that satisfy the filter requirements (described in Sections 2.1 and 2.2) and enter the sample over the sample period. The market illiquidity, *Illiq*, is the Amihud (2002) measure, the average ratio of daily absolute return to the daily trading volume over a three-month period, rolling every month over the sample period (starting from the month before the first). "*Illiq* mean" is value-weighted average *Illiq* calculated in each month for each market and averaged over all the months in the sample period, with both the daily return and the daily value of the trading volume being in US dollars. The sample period is from January 1990 to December 2011. The markets are divided into 19 emerging markets and 26 developed markets, following the classification method of the World Bank and Griffin, Kelly, and Nardari (2010).

Market	Starting year	Number of months	Average number of firms	Total number of firms	*Illiq* mean
Emerging markets					
Argentina	1993	174	60	121	0.162
Bangladesh	1995	197	135	245	0.788
Brazil	1994	197	115	402	0.216
Chile	1990	260	115	271	0.184
China	1993	223	962	2,153	0.004
Egypt	1997	167	77	122	0.213
India	1995	195	858	2,980	3.252
Indonesia	1990	253	175	469	0.544
Malaysia	1990	260	584	994	0.134
Mexico	1990	247	78	282	0.134
Pakistan	1992	225	147	352	0.808
Peru	1994	140	64	195	0.246
Philippines	1991	248	123	272	0.530
Poland	1998	162	132	391	2.363
Romania	1997	103	61	147	2.336
South Africa	1990	260	302	844	0.120
Sri Lanka	1990	254	125	272	1.828
Thailand	1990	260	385	1,145	0.254
Turkey	1990	260	233	417	0.063
Average		215	249	635	0.746
Developed markets					
Australia	1990	260	934	2,692	0.093
Austria	1990	253	82	206	0.070
Belgium	1995	202	139	309	0.034
Canada	1990	260	918	2,372	0.089
Cyprus	1999	135	90	159	1.187
Denmark	1990	257	162	368	0.058
Finland	1997	179	121	201	0.045
France	1991	242	390	1,096	0.032
Germany	1993	157	673	1,387	0.089
Greece	1990	259	204	380	0.118
Hong Kong	1990	260	625	1,325	0.055
Israel	1993	224	387	774	0.684
Italy	1993	218	255	547	0.008
Japan	1990	260	2,176	3,176	0.011
Netherlands	1990	260	150	300	0.025
New Zealand	1992	231	98	244	0.132
Norway	1990	260	154	550	0.077
Portugal	1994	135	75	170	0.162
Singapore	1990	260	314	720	0.098
South Korea	1990	260	1,126	2,425	0.067
Spain	1990	259	122	236	0.024
Sweden	1990	260	325	1,098	0.045
Switzerland	1990	257	243	527	0.011
Taiwan	1991	245	513	890	0.004
UK	1990	260	302	564	0.004
US	1990	260	1,945	4,974	0.001
Average		235	482	1,065	0.124
World		227	383	884	0.387

volume) during the three-month window and at least three valid daily observations in month $t-1$.[9] Excluded are stock-days with trading volume below one hundred US dollars, and we remove extreme observations of *Illiq* within each stock market by excluding stocks with *Illiq* in the top 1% in each three-month window. We also delete in each three-month window stocks whose price is at the top and bottom 1%. A stock also needs to have data on its number of shares outstanding at the end of

[9] Our results are robust to requiring that there is a minimum of 20 valid daily observations in the formation window, but this increases the exclusion of stocks.

month t (this enables to calculate the stock value, which is used for value weighting). Finally, a country-month is included in the sample if it has at least 50 stocks that satisfy all the above filters. Our final sample has 39,764 stocks traded in 45 markets.

Table 1 presents some sample statistics. The sample period is 1990–2011 for most countries, with data starting later for some countries (the latest beginning date is 1999 for Cyprus). The average number of stocks for each country per month varies between 2,176 (Japan) and 60 (Argentina). Developed markets have generally more stocks than emerging markets, with China and India having exceptionally large number of stocks among the emerging markets. The value-weighted average monthly *Illiq* in a country shows significant variation across countries. *Illiq* is computed here in US dollar volume and returns (the conversion employs daily exchange rates from Datastream) for each stock in each month and then averaged across stocks. As expected, average *Illiq* is much larger for emerging markets than it is for developed markets.

2.3. Formation of illiquidity portfolios

We assess the effect of liquidity on stock returns by forming illiquidity-based portfolios of stocks in each market. We sort stocks at the beginning of month t based on their illiquidity in months $t-3$ to $t-1$, aggregate them into quintile portfolios, and calculate the average returns for these portfolios in months $t+1$, $t+2$, and $t+3$. The differential return between the most illiquid and least illiquid portfolio estimates the illiquidity premium.[10] Because *Illiq* is positively correlated with volatility [see Amihud (2002) and others], which is known to affect stock expected return, the effects of illiquidity and volatility could be confounded. Therefore, we condition the sorting of stocks on *Illiq* by pre-sorting on return volatility. First, we sort stocks into three portfolios by their standard deviation of daily return over months $t-3$ to $t-1$. Then, within each volatility tercile, stocks are sorted into quintiles by their *Illiq* over months $t-3$ to $t-1$. This provides ranking by liquidity, controlling for volatility.[11] We thus obtain 15 (3×5) portfolios with equal number of stocks in each. The high-*Illiq* quintile portfolio consists of three portfolios across three levels of volatility, and the same applies for the low-*Illiq* quintile portfolio.

We then calculate the average return for each of the 15 portfolios over each of the following three months $t+1$, $t+2$, and $t+3$. We skip month t, which immediately follows the portfolio formation, to avoid possible short-term return reversals (see Ang, Hodrick, Xing, and Zhang, 2009). The average monthly portfolio returns are calculated using three weighting methods.

(1) Return-weighted average. This modified equally weighted average of portfolio returns follows Asparouhova, Bessembinder, and Kalcheva (2010, 2013). Each return $R_{i,t}$ of stock i in month t is multiplied by a weight proportional to its prior-month gross return $(1+R_{i,t-1})$. This method corrects for microstructure noise bias, pointed out by Blume and Stambaugh (1983).
(2) Value-weighted average. Stock returns are weighted by their market capitalization at the end of the preceding month. This weighting method alleviates the potential bias in the expected returns of less-liquid stocks due to noisy prices, as pointed out by Blume and Stambaugh (1983, p. 393) and Asparouhova, Bessembinder, and Kalcheva (2013). The drawback of this procedure is that it emphasizes more the evidence from large firms. Hasbrouck (2009, p. 1464) notes: "Due to the inverse relationship between market capitalization and liquidity, averages weighted by market capitalization (value-weighted averages) tend to suppress variation in effective cost."
(3) Volume-weighted average. Stock returns are weighted by the monetary values of the trading volume over the portfolio formation period (months $t-3$ to $t-1$). This is because in most countries (excluding the US and the UK), the value of the free float available for trading is a fraction of the market capitalization as companies are controlled by majority owners or large-block shareholders. Then, weighting by volume (in monetary terms) represents a more feasible trading strategy (long and short positions) than does weighting by market value. In addition, monetary volume weighting, which uses prior-period price, helps reduce the bias due to microstructure noise. With the prior price involved, the method induces a negative covariance between weights and observed returns, which Blume and Stambaugh (1983) show is needed to eliminate upward bias in average return.[12]

Finally, we construct the zero-investment liquidity premium factor $IML_{c,t}$, the monthly return on the illiquid-minus-liquid quintile portfolios (across the volatility portfolios) for country c in month t.

2.4. Global and regional risk factors

The risk-adjusted *IML* excess return is obtained as the intercept $\alpha_{IML,c}$ from a regression of $IML_{c,t}$ on common risk factors that follow those of Fama and French (1993). The factors, RM, SMB, and HML pertain, respectively, to the market excess returns, the size (small-minus-big) and value (high-minus-low book-to-market) factor returns. We use both global and regional indexes, following studies of international asset pricing (e.g., Bekaert, Hodrick, and Zhang, 2009; and Ang, Hodrick, Xing, and Zhang, 2009). Bekaert Hodrick, and Zhang (2009, p. 2596) state: "We choose to use regional factors rather than country factors as local factors because Brooks and Negro (2005) show that within-region country factors can be mostly explained

[10] An illiquidity return factor for the US has been constructed by Liu (2006) and by Amihud (2014).

[11] Our procedure resembles that of Fama and French (1993, p. 9) in their formation of the HML factor (high-minus-low book-to-market stocks). They construct their book-to-market portfolios by first sorting stocks on size (market capitalization) and within each size portfolio they sort stocks on book-to-market ratio. This methodology captures the book-to-market effect on return, controlling for the size effect.

[12] We thank the referee for pointing this out.

Table 2
Illiquidity return premium, *IML*.

Panel A presents the mean of the country's average of the illiquidity premium, IML_c, the return on illiquid-minus-liquid stock portfolios, and of $a_{IML,c}$, the risk-adjusted illiquidity premium for each country *c* from a global six-factor model. For each country, stocks are sorted at the beginning of month *t* into three portfolios by the standard deviation of their daily return over a three-month period, months $t-3$ 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. Then, average returns are calculated for each of the double-sorted portfolios for months $t+1$, $t+2$, and $t+3$, and the portfolio formation is repeated for the subsequent three months. We use three methods to average returns: return weighting [modified equally weighted returns to reduce potential bias, following Asparouhova, Bessembinder, and Kalcheva (2010, 2013)], value weighting (using in each month the stock's market capitalization at the end of the previous month), and volume weighting (using in each month the monetary value of stock's trading volume in the portfolio formation period, months $t-3$ to $t-1$). All returns are adjusted to be in terms of US dollars. 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).

$$IML_{c,t} = \alpha_{IML,c} + \beta 1_c RMg_t + \beta 2_c SMBg_t + \beta 3_c HMLg_t + \beta 4_c RMreg_{c,t} + \beta 5_c SMBreg_{c,t} + \beta 6_c HMLreg_{c,t} + e_{c,t}$$

RMg_t is the return on the Morgan Stanley Capital International global index in excess of US one-month Treasury bill rate, and $SMBg_{,t}$ is the global small-minus-big factor return, the average (weighted by the country's market capitalization) of the 45 countries' size factor. $HMLg_{,t}$ is the similarly constructed high-minus-low book-to-market factor. The regional factors $RMreg_{c,t}$, $SMBreg_{c,t}$, and $HMLreg_{c,t}$ are constructed in the same way for each region, and then we use the residuals (plus intercept) from regressing each regional factor on its corresponding global factor. There are three regions – America, Asia-Pacific, and Europe (extended), with each region being divided into emerging and developed markets. 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%).

Panel B reports the slope coefficients (β) of the risk factor regression described above. We estimate the regression model for each country and report the cross-country statistics of coefficient estimates for all sample markets. The *t*-statistics for the cross-country averages are in parentheses below the mean value. 'Pos' is the number of markets with positive coefficients. (*t*-stat)* is the *t*-statistic of a test whether the ratio of positive coefficients=0.5, the chance result. Panel C provides estimates of the relative illiquidity premium, $RIML_{c,t}$, defined as $IML_{c,t}$ in country *c* and month *t* scaled by the relative illiquidity *RIlliq*, the difference in illiquidity between the most illiquid and the most liquid stock quintile portfolios relative to the average illiquidity in country *c* and month *t*. Illiquidity is calculated over the portfolio formation period (months $t-3$ to $t-1$), which precedes the period over which the *IML* returns are calculated (months $t+1$ to $t+3$).

Panel A: Means and risk-adjusted means of the illiquidity return premium, IML

	Return weighted		Value weighted		Volume weighted	
	IML_c	$\alpha_{IML,c}$	IML_c	$\alpha_{IML,c}$	IML_c	$\alpha_{IML,c}$
Global markets (all 45 countries)						
Mean	0.801	0.817	0.493	0.453	0.751	0.734
(*t*-statistic)	(7.43)	(7.07)	(5.50)	(4.67)	(7.42)	(6.53)
Median	0.773	0.760	0.506	0.508	0.621	0.704
Percent positive	86.7	84.4	82.2	66.7	91.1	80.0
p-Value	0.000	0.000	0.000	0.018	0.000	0.000
Emerging markets (19 countries)						
Mean	1.105	1.161	0.822	0.741	0.951	0.932
(*t*-statistic)	(8.59)	(7.55)	(6.39)	(4.97)	(6.81)	(5.63)
Median	1.062	1.019	0.806	0.786	0.876	1.044
Percent positive	100.0	100.0	94.7	78.9	100.0	84.2
p-Value	0.000	0.000	0.000	0.010	0.000	0.002
Developed markets (26 countries)						
Mean	0.579	0.566	0.253	0.243	0.604	0.590
(*t*-statistic)	(3.90)	(3.79)	(2.49)	(2.15)	(4.40)	(3.96)
Median	0.449	0.355	0.318	0.116	0.521	0.519
Percent positive	76.9	73.1	73.1	57.7	84.6	76.9
p-Value	0.005	0.014	0.014	0.279	0.000	0.005

Panel B: Means of the factors' slope coefficient

	RMg	*SMBg*	*HMLg*	$RMreg_c$	$SMBreg_c$	$HMLreg_c$	R^2
Return-weighted method							
Mean	−0.338	0.200	0.091	−0.184	0.368	−0.007	21%
(*t*-statistic)	(15.17)	(4.04)	(1.70)	(7.54)	(8.18)	(0.16)	
Median	−0.378	0.213	0.095	−0.168	0.309	−0.009	18%
Pos (*t*-stat)*	1 (6.41)	34 (3.43)	29 (1.94)	6 (4.92)	42 (5.81)	21 (0.15)	
Value-weighted method							
Mean	−0.358	0.263	0.144	−0.178	0.469	−0.027	22%
(*t*-statistic)	(13.44)	(4.76)	(2.71)	(6.38)	(9.18)	(0.57)	
Median	−0.338	0.325	0.111	−0.177	0.453	−0.019	19%
Pos (*t*-stat)*	1 (6.41)	35 (3.73)	29 (1.94)	8 (4.32)	44 (6.41)	21 (0.45)	

Table 2 (*continued*)

Panel B: Means of the factors' slope coefficient

	RMg	*SMBg*	*HMLg*	$RMreg_c$	$SMBreg_c$	$HMLreg_c$	R^2
Volume-weighted method							
Mean	−0.323	0.308	0.088	−0.180	0.502	−0.029	19%
(*t*-statistic)	(12.60)	(4.84)	(1.51)	(6.52)	(8.88)	(0.61)	
Median	−0.328	0.341	0.145	−0.158	0.373	−0.045	17%
Pos (*t*-stat)*	1 (6.41)	36 (4.02)	28 (1.64)	8 (4.32)	42 (5.81)	22 (0.15)	

Panel C: Means and risk-adjusted means of relative illiquidity return premium, RIML

	Return weighted		Value weighted		Volume weighted	
	$RIML_c$	$a_{RIML,c}$	$RIML_c$	$a_{RIML,c}$	$RIML_c$	$a_{RIML,c}$
Global markets (all 45 countries)						
Mean	0.281	0.274	0.266	0.198	0.264	0.244
(*t*-statistic)	(6.70)	(6.31)	(3.01)	(3.94)	(6.00)	(5.21)
Median	0.254	0.245	0.141	0.147	0.181	0.181
Percent positive	84.4	80.0	80.0	66.7	82.2	75.6
p-Value	0.000	0.000	0.000	0.018	0.000	0.000
Emerging markets (19 countries)						
Mean	0.420	0.409	0.519	0.353	0.363	0.315
(*t*-statistic)	(7.05)	(6.06)	(2.71)	(3.68)	(4.88)	(3.95)
Median	0.430	0.426	0.376	0.295	0.271	0.295
Percent positive	100.0	89.5	94.7	78.9	89.5	78.9
p-Value	0.000	0.000	0.000	0.010	0.000	0.010
Developed markets (26 countries)						
Mean	0.180	0.175	0.081	0.085	0.191	0.192
(*t*-statistic)	(3.58)	(3.55)	(2.32)	(2.08)	(3.83)	(3.47)
Median	0.120	0.112	0.091	0.059	0.144	0.136
Percent positive	73.1	73.1	69.2	57.7	76.9	73.1
p-Value	0.014	0.014	0.038	0.279	0.005	0.014

by regional factors. The use of regional factors also reduces the number of factors included in each model." Our empirical model is

$$IML_{c,t} = \alpha_{IML,c} + \beta 1_c RMg_t + \beta 2_c SMBg_t + \beta 3_c HMLg_t + \beta 4_c RMreg_{c,t} + \beta 5_c SMBreg_{c,t} + \beta 6_c HMLreg_{c,t} + e_{c,t} \quad (2)$$

The factors are global (g) and regional (reg), the latter being assigned to the country where it is located (hence the subscript c).[13]

The global market factor (RMg) is the return on the Morgan Stanley Capital International (MSCI) global equity index in excess of US one-month Treasury bill rate. Following earlier studies, the other global and regional risk factors are constructed by aggregating the risk factors of each country, with all returns converted to US dollar returns. A country's SMB and HML factors are constructed following the methodology in Fama and French (1993). We first divide the stocks in each country at the end of June of each year into two equal size groups based on the median market capitalization. Then we divide each size portfolio into three groups based on the value of the book-to-market ratio of equity, in which the equity market value is for the end of the previous calendar year and the book value is for the end of the previous fiscal year. The three BE/ME groupings use as breakpoints the 30th and 70th percentiles of all stocks with positive book value of equity. We thus have 6 (2×3) portfolios ranked on size and BE/ME. The country's SMB factor is the difference of the value-weighted average returns of the two size-based portfolios (small minus big), and HML is the difference between the value-weighted average returns of the two extreme BE/ME portfolios across the two size portfolios.

The returns on the global factors $SMBg_t$ and $HMLg_t$ are the monthly value-weighted average of the country's SMB and HML factors, using as weights the country's stock market capitalization at the end of the previous month. The regional return factors are constructed by aggregating the countries into three regions — Asia-Pacific, America, and Europe (the last includes Israel, Turkey, Egypt, and South Africa) — each split between developed and emerging markets. The regional market factor is the value-weighted average (using the country's stock market capitalization) of each country's value-weighted market return (all in US dollar terms) in excess of the one-month US Treasury bill rate. Similarly, the regional SMB and HML factors are constructed as the weighted average of the country-specific factor returns. Each regional factor is orthogonalized against its respective global factor, i.e., we use the residuals plus the intercept from a regression of the regional factor on the corresponding global factor. The regional factors assigned to each country in the estimation

[13] The US momentum and reversal factors have insignificant coefficients when added to a regression of the US's *IML* on the US Fama and French factors. Hence, we omit it from the global model. The coefficient of the momentum factor is -0.03 ($t = -1.08$). Adding the reversal factor, its coefficient is 0.02 ($t = 0.35$).

of model (2) are of the region where the country is included.

3. The pricing of liquidity in global markets

3.1. The illiquidity return premium

Table 2, Panel A, presents statistics on the illiquidity return premium (IML_c) and the risk-adjusted illiquidity return premium – the intercept ($\alpha_{IML,c}$) estimated from model (2). We report both the global mean values and the means among emerging and developed markets. The calculation of IML in each country is based on the three weighting schemes: return-weighted, value-weighted, and volume-weighted.

The results show that stock illiquidity is priced in global markets. Across the 45 countries, the mean illiquidity premium IML_c and the mean risk-adjusted illiquidity premium α_{IMLc} are positive and statistically significant, being higher in emerging markets than they are in developed markets. The illiquidity premium is economically meaningful. The mean return-weighted IML_c is 0.80% per month, being 1.11% in emerging markets and 0.58% in developed markets.[14] The corresponding mean $\alpha_{IML,c}$ is 0.82% (t=7.07), being 1.16% (t=7.55) and 0.57% (t=3.79) for emerging and developed markets, respectively. The medians of IML_c and $\alpha_{IML,c}$ are only slightly lower than the means, indicating that the results are not driven by outliers. Overall, 84.4% of the country $\alpha_{IML,c}$ estimates are positive, which is significantly different from the chance result of 50% ($p<0.01$). This result holds for both emerging and developed markets.

The results for the value-weighted and volume-weighted portfolio returns are qualitatively similar. The means of both IML_c and α_{IMLc} are positive and statistically significant. The means of value-weighted IML_c and α_{IMLc} are lower than those of return-weighted, and the means of volume-weighted IML_c and α_{IMLc} are close in magnitude to those obtained from return-weighted returns. Further, we test whether $\alpha_{IML,c}$ is lower for developed markets compared with emerging ones by regressing the 45 estimates of country $\alpha_{IML,c}$ on an intercept and a dummy variable that equals one for developed markets. The coefficient of this dummy variable is −0.595 (t=2.72), −0.498 (t=2.71), and −0.341 (t=1.52) for return-, value-, and volume-weighted returns, respectively.

Detailed country-level statistics are provided in the online Appendix. For example, globally, mean returns increase monotonically from the most liquid to the most illiquid quintile portfolios, and the raw IML returns and risk-adjusted IML returns are significantly positive in a majority of countries.

3.1.1. Four robustness tests

In the first robustness test we estimate model (2) in a pooled panel regression with time fixed effects. Standard errors are clustered by time and by country. In this model, the slope coefficients of the global factors, $\beta 1$-$\beta 3$ are the same for all countries and those of the regional factors, $\beta 4$-$\beta 6$, are the same for all countries in the same respective region. We report the result of α_{IML} for the three weighting methods of calculating the portfolio returns:

$$\text{Return}-\text{weighted returns}: \alpha_{IML}=1.046(t=5.23),$$

$$\text{Value}-\text{weighted returns}: \alpha_{IML}=0.584(t=2.38),$$

and

$$\text{Volume}-\text{weighted returns}: \alpha_{IML}=0.989(t=3.24).$$

The estimates of α_{IML} here are a little higher than the mean α_{IMLc} in Table 2 and their statistical significance is slightly lower, possibly because of the restriction on the coefficients across countries, which increases the standard errors of estimation of the intercept $\alpha_{IML,}$ given that the slope coefficients are likely to vary across countries (see Panel B of Table 2).

In the second robustness test, we estimate the risk-adjusted illiquidity return premium for the global IML by averaging the premiums across countries. This procedure accommodates the contemporaneous correlation of IML across countries. We regress the global average IML on a constant and the three global return factors RMg_t, $SMBg_t$, and $HMLg_t$:

$$\text{Return}-\text{weighted returns}: \alpha_{IML}=0.682(t=6.69),$$

$$\text{Value}-\text{weighted returns}: \alpha_{IML}=0.319(t=2.98),$$

and

$$\text{Volume}-\text{weighted returns}: \alpha_{IML}=0.591(t=5.55).$$

These α_{IML} estimates are statistically significant, and their magnitudes are somewhat lower than those in Table 2. The estimated standard errors here are slightly larger because we omit the regional factors from the regression.[15]

The third robustness test employs dollar trading volume as an alternative measure of liquidity to construct the liquidity-based portfolios, following Brennan, Chordia, and Subrahmanyam (1998). The resulting estimates of IML are similar to those reported in Table 2; details are reported in the online Appendix. For example, the return-weighted average IML_c is 0.89% (t=7.38) and the average $\alpha_{IML,c}$ is 0.90% (t=7.14).

The fourth robustness test examines whether our results are driven by microcap stocks, which are usually highly illiquid. We reconstruct all portfolios after removing from the sample the smallest 10% of firms in terms of market capitalization (at the end of each three-month portfolio-formation period) and then construct IML for this reduced-size sample. The results (presented in the online Appendix) show that the risk-adjusted illiquidity premium remains positive and significant, though its point estimate is naturally lower. The mean of $\alpha_{IML,c}$ is 0.56 (t=4.87), 0.35

[14] The standard equally weighted mean IML_c is higher, 1.03%, being 1.35% and 0.79% for emerging and developed markets, respectively. This is consistent with the Blume and Stambaugh (1983) suggestion that equally weighted portfolio returns are biased upward due to microstructure noise. The return-weighted procedure of Asparouhova, Bessembinder, and Kalcheva (2013) is intended to correct this bias.

[15] In Section 4.1, we test again the significance of mean α_{IML} after controlling for cross-country common factors.

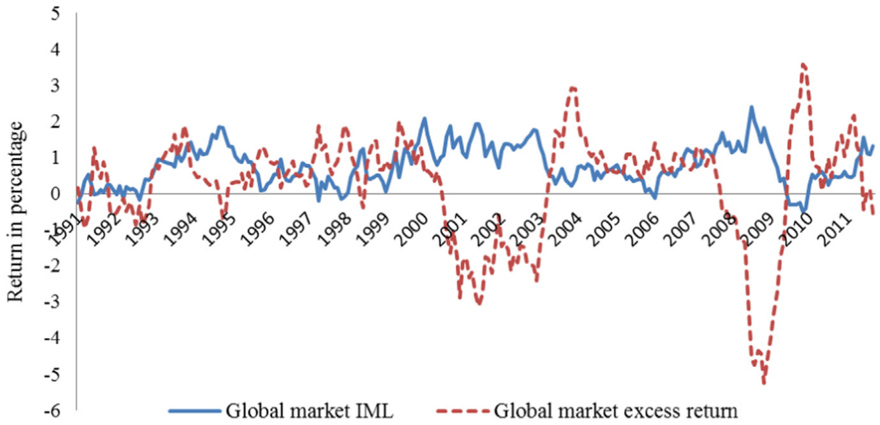

Fig. 1. Global illiquidity return premium and global stock market returns. This figure presents the time series of the global average of the return-weighted illiquid-minus-liquid portfolio returns across all the sample markets ($IML_{G,t}$) and the Morgan Stanley Capital International global equity index return in excess of the one-month Treasury bill rate ($RM_{G,t}$). In the figure is the 12-month moving average of these return indexes. The period is from January 1990 to December 2011.

(t=3.35) and 0.59 (t=4.64) for return-weighted, value-weighted, and volume-weighted portfolio returns, respectively, and the proportion of countries with $\alpha_{IML}>0$ is significantly greater than 0.50, the chance result. Our findings are also robust to excluding stocks that belong to the lowest price decile.

In summary, our empirical results provide strong support for the prevalence of illiquidity premium worldwide for the great majority of countries. The mean illiquidity return premium and the risk-adjusted illiquidity premium are positive and significant both economically and statistically.

3.2. The exposure of the illiquidity return premium to factor risk

Model (2), where $IML_{c,t}$ is regressed on six global and regional Fama and French risk factors, produces six slope coefficients, $\beta 1_c$–$\beta 6_c$, whose means are presented in Panel B of Table 2. The most consistent relation is between *IML* and market returns. The coefficients $\beta 1_c$ of the global excess returns, RMg_t, are all negative, and the coefficients $\beta 4_c$ of the orthogonalized regional market return, $RMreg_{c,t}$, are also negative for the great majority of countries. (In the majority of countries, these βs are significant at better than the 10% level.) That is, the illiquidity premium rises in times of adverse market conditions. This relation is also presented in Fig. 1, which depicts the 12-month moving average of $IMLg_t$, the global cross-country average return-weighted illiquidity premium, and RMg_t. The two series move in opposite directions. We also compute the annual correlation between $IMLg_t$ and RMg_t from the 12 monthly returns in each year. This correlation is negative in all years but one, with a mean of −0.68 and median of −0.81, demonstrating the strong negative relation between the illiquidity premium and the global market portfolio return.

The coefficients of the SMB factors (both global and regional) in Panel B of Table 2 are generally positive because firm size is associated with liquidity and the size premium is partly due to the illiquidity premium (see Amihud and Mendelson, 1986). The coefficients of the global and regional HML factors have insignificant means, implying that no clear relation exists between the illiquidity premium and the value premium. The factors' coefficients are generally similar for the three weighting methods of calculating average portfolio returns.

3.3. The relative illiquidity return premium

Variations in $IML_{c,t}$ across countries and over time can arise from variations in the price (in returns) per unit of illiquidity and from variations in the illiquidity spread between the most and least illiquid stock portfolios, both between countries and within a country over time. We therefore construct a standardized illiquidity return premium by dividing $IML_{c,t}$ by the relative spread in *Illiq* between the high-*Illiq* and low-*Illiq* portfolios in each country. The relative illiquidity premium for country c in month t, $RIML_{c,t}$, is defined as $RIML_{c,t}=IML_{c,t}/RIlliq_{c,t}$, where $RIlliq_{c,t}=(Illiq_{Hi,c,t}-Illiq_{Lo,c,t})/avr(Illiq_{c,t})$, representing the relative illiquidity spread between the high- and low-illiquidity portfolios. $Illiq_{Hi}$ and $Illiq_{Lo}$ are the average illiquidity of the most and least illiquid quintile portfolios, respectively, and $avr(Illiq)$ is the average illiquidity over all the illiquidity quintiles. Scaling the illiquidity spread by average illiquidity makes it more comparable across countries and over time, and *RIML* can be interpreted as the return compensation per unit of relative illiquidity spread.[16] We use equally weighted *Illiq* for return-weighted and volume-weighted *IML*, and value-weighted *Illiq* for value-weighted *IML*. Notably, illiquidity is calculated over the portfolio formation period, months $t-3$ to $t-1$, which precedes the period over which the monthly *IML* returns are calculated, months $t+1$ to $t+3$. We then replicate the analysis that is done for Table 2.

[16] Because of the high positive skewness in the distribution of *Illiq*, $Illiq_{Hi,c,t}$ and $avr(Illiq_{c,t})$ are positively correlated. This reduces the variation in $RIlliq_{c,t}$ compared with the variation in $IML_{c,t}$. Also, the value of $RIlliq_{c,t}$ changes once every (non-overlapping) three months, while the numerator changes monthly.

Table 3
Illiquidity return premium using Fama-MacBeth cross section regressions.
Summary of the estimated coefficients of the cross-sectional regression model,

$$R_{c,j,t} = b0_{c,t} + b1_{c,t}Illiqma_{c,j,t-2} + b2_{c,t}logSIZE_{c,j,t-2} + b3_{c,t}B/M_{c,j,t-n} + b4_{c,t}logSTDEV_{c,j,t-2} + b5_{c,t}R_{c,j,t-2-4} + b6_{c,t}R_{c,j,t-5-13} + e_{c,j,t}$$

$R_{j,t}$ is the return of stock *j* in month *t*. $Illiqma_{j,t-2}$ is the Amihud illiquidity measure *Illiq*, which is mean-adjusted for the country in each month, thus being standardized for all countries and over time. log $SIZE_{j,t-2}$ 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 (1992). log $STDEV_{j,t-2}$ is the stock *j*'s daily return standard deviation. $R_{,t-2–4}$ and $R_{,t-5–13}$ are the stock's lagged returns during $t-2$ to $t-4$ and $t-5$ to $t-13$ respectively. All variables are in US dollars. *Illiq* and *STDEV* are calculated over a rolling window of three months, then we skip one month. The cross-section regression model is estimated for each month. The regressions are estimated for each of the 43 countries and are return-weighted to reduce potential bias, following Asparouhova, Bessembinder, and Kalcheva (2010, 2013). The mean coefficient is calculated for each country *c* following the Fama and MacBeth (1973) procedure. The table reports the statistics of the country mean coefficients across the 43 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 Fama-MacBeth regression coefficients are equally likely to be positive or negative (i.e., probability of 50%). The last (rightmost) column ($wb1_c$) present statistics of the precision-weighted mean coefficients for each country. The weight is the reciprocal of the coefficient's standard error in month *t*, i.e., a higher weight means greater precision.

	Constant	$Illiqma_j$ ($b1_c$)	log $SIZE_j$	B/M_j	log $STDEV_j$	$R_{j,t-2–4}$	$R_{j,t-5–13}$	$Illiqma_j$ ($wb1_c$)
Global markets (all 43 countries)								
Mean	1.853	0.063	−0.169	0.380	−0.720	1.464	0.528	0.071
(*t*-statistic)	(8.02)	(3.67)	(5.16)	(5.38)	(9.19)	(6.78)	(6.82)	(4.61)
Median	1.646	0.062	−0.103	0.321	−0.611	1.346	0.466	0.064
Percent positive	93.0%	79.1	16.3	88.4	4.7	81.4	83.7	83.7
p-Value	0.000	0.000	1.000	0.000	1.000	0.000	0.000	0.000
Emerging markets (17 countries)								
Mean	2.565	0.076	−0.263	0.416	−0.740	0.872	0.276	0.113
(*t*-statistic)	(5.86)	(1.90)	(3.91)	(2.65)	(4.86)	(2.24)	(2.80)	(3.61)
Median	2.898	0.068	−0.149	0.301	−0.519	0.856	0.313	0.084
Percent positive	94.1	82.4	11.8	82.4	5.9	70.6	70.6	88.2
p-Value	0.000	0.006	1.000	0.006	1.000	0.072	0.072	0.001
Developed markets (26 countries)								
Mean	1.388	0.055	−0.109	0.356	−0.706	1.852	0.693	0.044
(*t*-statistic)	(6.44)	(4.35)	(4.01)	(6.06)	(8.26)	(8.22)	(6.99)	(3.27)
Median	1.213	0.058	−0.070	0.339	−0.618	1.837	0.704	0.052
Percent positive	92.3	76.9	19.2	92.3	3.8	88.5	92.3	80.8
p-Value	0.000	0.005	1.000	0.000	1.000	0.000	0.000	0.001

Table 2, Panel C, presents summary results for $RIML_c$ and $\alpha_{RIML,c}$. The mean return-weighted $RIML_c$ and $\alpha_{RIML,c}$ are 0.281% and 0.274%, respectively, and they are highly significant (t=6.70 and 6.31, respectively), meaning that investors earn 0.28 basis point more per month when the stock's illiquidity is higher by 1% of its country's market average illiquidity. The medians are very close to the means, suggesting that the results are not generated by extreme observations. The great majority of the countries have positive $RIML_c$ and $\alpha_{RIML,c}$. As in Panel A of Table 2, $RIML_c$ and $\alpha_{RIML,c}$ are higher for emerging markets than they are for developed markets, being positive and significant for both groups of countries. The results for the value-weighted and volume-weighted $RIML_c$ and $\alpha_{RIML,c}$ are qualitatively similar. Both measures of relative illiquidity premium are significantly positive across portfolio weighting schemes. The evidence suggests that the global price of the firm illiquidity characteristic is significantly positive.[17]

[17] As a robustness test, we reestimate the models with *RIML* being constructed from stock portfolios that exclude microcap stocks, those with the smallest 10% in market capitalization (or stock price) at the end of each three-month portfolio-formation period. The results (shown in the online Appendix) are that the mean of $\alpha_{RIML,c}$ is positive and significant.

3.4. The illiquidity return premium, estimated from cross-sectional regressions

We provide an alternative estimation of the illiquidity premium using individual stock returns and employing the Fama and MacBeth (1973) cross-sectional regression approach as in Amihud (2002). For each country *c* and month *t*, we estimate the regression model across individual stocks indexed by *j*:

$$\begin{aligned} R_{c,j,t} = {} & b0_{c,t} + b1_{c,t}Illiqma_{c,j,t-2} + b2_{c,t}\log SIZE_{c,j,t-2} \\ & + b3_{c,t}B/M_{c,j,t-n} + b4_{c,t}\log STDEV_{c,j,t-2} \\ & + b5_{c,t}R_{c,j,t-2-4} + b6_{c,t}R_{c,j,t-5-13} + e_{c,j,t}. \end{aligned} \quad (3)$$

$Illiqma_{c,j,t}$ is the mean-adjusted illiquidity used in Amihud (2002), defined as the ratio of $Illiq_{c,j,t}$ to the mean of $Illiq_{c,j,t}$ across all stocks in the country for that month. The values of $Illiqma_{c,j,t}$ thus hover around 1.0 across countries and over time, providing standardization of the illiquidity measure. $STDEV_{c,j,t}$ is the return standard deviation. The variables $Illiq_{c,j,t-2}$ and $STDEV_{c,j,t-2}$ are calculated over a rolling three-month window from $t-4$ to $t-2$. Then we skip one month and estimate the cross section regression Model (3) for month *t*. $SIZE_{c,j,t-2}$ is the stock market capitalization, calculated at the end of month $t-2$. $B/M_{c,j,t\text{-}n}$ 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 (1992).[18] $R_{c,j,t-2-4}$ and $R_{c,j,t-5-13}$ are lagged returns (in decimals) over the preceding three months and over the nine months that precede them, to capture the momentum effect (Jegadeesh and Titman, 1993). The variables are all in US dollars.

The cross section regression Model (3) is estimated for each country *c* by the return-weighted method proposed by Asparouhova, Bessembinder, and Kalcheva (2010), the weights being (one plus) the lagged return. This method is designed to correct for potential bias in asset pricing tests resulting from microstructure noise. Then we calculate bk_c, $k=1, 2, \ldots, 6$, the means of the monthly coefficients for each country *c*. The analysis includes 43 countries; Romania and Bangladesh are excluded because of missing data. Table 3 presents the statistics of the coefficients bk_c.

We focus on the coefficient $b1$, the monthly illiquidity premium after controlling for other firm characteristics. The cross-country mean of $b1_c$ is positive, 0.063, and significant ($t=3.67$). It is 0.076 for the emerging markets and 0.055 for the developed markets, both significant. Notably, the mean $b1_c$ here is close in magnitude to 0.088, the mean value of the similar coefficient estimated by (Amihud, 2002, Table 2) for the US in 1981 – 1997, a period that partly overlaps with the estimation period here.

As for the other coefficients, that of log(*SIZE*) is negative and significant, consistent with the well-known size effect. The coefficient of return volatility is negative, consistent with the findings in Amihud (2002) and in Ang, Hodrick, Xing, and Zhang (2009). Also, the coefficient of book-to-market (B/M) ratio is positive and significant, and evidence shows a momentum effect, indicated by the positive and significant coefficients of the past three-month and past nine-month stock returns (see Jegadeesh and Titman, 1993; Griffin, Ji, and Spencer, 2003). These findings are consistent with the notion that firm characteristics drive stock returns in the US market (e.g., Daniel and Titman, 1997) and internationally (Hou, Karolyi, and Kho, 2011).

The two measures of illiquidity premium, *IML* and $b1$, are naturally positively correlated. For the return-weighted returns (used in both *IML* and $b1$), the correlation across countries between IML_c and $b1_c$ is 0.503 ($p=0.001$). (IML_c and $b1_c$ are the averages of these variables for each country.) The cross-country correlation between the country's $\alpha_{IML,c}$ and $b1_c$ is 0.358 ($p=0.019$). We then test the time series relation between *IML* and $b1$ by constructing global series $IMLg_t$ and $b1g_t$, which are the monthly cross-country average of $IML_{c,t}$ (return weighted) and $b1_{c,t}$. These are time series of global illiquidity monthly return premium. The correlation between these two series is 0.547 ($p=0.000$). Both series have positive and significant mean. The mean $b1g_t$ is 0.059 ($t=3.98$) and the mean $IMLg_t$ is 0.811 ($t=5.470$). Regressing $IMLg_t$ on $b1g_t$ produces an intercept of 0.488 ($t=3.80$) and a positive and significant slope coefficient, 5.519 ($t=10.30$).[19]

In a robustness test, we calculate the mean $wb1_{c,t}$, the precision-weighted coefficients $b1_{c,t}$, where $wb1_{c,t}$ is $b1_{c,t}$ weighted by the inverse of its standard error that is obtained from the within-country cross-sectional regression. This procedure assigns greater weights to coefficients that are more precisely estimated.[20] The results, presented in the last (rightmost) column of Table 3, are qualitatively the same as those of $b1_{c,t}$ both in terms of magnitude and significance. The precision-weighted estimate of the global-average $wb1$ is 0.071, which is close to the estimate of 0.063 for $b1$, and $t=4.61$. The average $wb1_c$ for emerging and developed markets are, respectively, 0.113 and 0.044, consistent with the finding in Table 2 for *IML*. The estimates of $b1_c$ and $wb1_c$ are robust to removing the smallest 10% of stocks (in terms of market capitalization or stock price) in each country. (Results are available in the online Appendix.)

In summary, we employ a number of methods to calculate the illiquidity premium, using portfolio-based estimates (*IML* and *RIML*) and estimates based on cross-section regressions ($b1$ and $wb1$). The results support the proposition that the worldwide illiquidity return premium is positive and significant.

4. Commonality in illiquidity return premiums across countries

We introduce and study the global cross-country commonality in illiquidity return premiums, i.e., the extent to which each country's illiquidity return premium co-varies with the global and regional average illiquidity return premiums. Commonality in the level of illiquidity has been studied in the US by Chordia, Roll, and Subrahmanyam (2000), Hasbrouck and Seppi (2001), and Huberman and Halka (2001). In the international context, Brockman, Chung, and Perignon (2009) present evidence of global commonality in the level of illiquidity, both within and across markets. Karolyi, Lee, and van Dijk (2012) study commonality in illiquidity within countries and report the factors that affect it and its variation over time. Lee (2011) shows that the systematic risk (beta) of the global illiquidity factor (the covariance of stock liquidity with aggregate global liquidity) is priced, with both the illiquidity beta and its risk premium being constant over time.

The liquidity-related commonality that we study is in the illiquidity premium or the price of illiquidity across countries and over time. Following the Brunnermeier and Pedersen (2009) model, variations in illiquidity premium could reflect variations in the shadow price of financial constraints or variations in margin requirement, which can be interpreted as the price of illiquidity. In addition, there are agency theory-based considerations. Acharya and Viswanathan (2011)

[18] For the US, we use the book value that is known in December of the previous year and the market value in June before the 12 months whose returns are used in the regressions, beginning in July. For other countries, we use the ratio of the book-to-market value of equity at June of the previous year obtained from Datastream.

[19] For the value-weighted $IMLg_t$, the intercept from its regression on $b1g_t$ is 0.146 ($t=1.02$) and the slope coefficient is 5.555 ($t=9.30$).

[20] Ferson and Harvey (1999, Appendix A) propose this procedure to correct for potential heteroskedasticity in the Fama and MacBeth estimations.

Table 4
Commonality in illiquidity return premium, *IML* and $b1$.

Summary of the coefficients estimated from country-by-country time series regressions of monthly illiquidity premium for country c in month t ($IPrem_{c,t}$) on the global ($IPrem^c g_t$) and regional ($IPrem^c reg_{c,t}$) aggregate illiquidity premium. For $IPrem_{c,t}=IML_{c,t}$ (the return on illiquid-minus-liquid portfolios) we estimate the factor model (as described in Table 2):

$$IPrem_{c,t} = \varphi 0_c + \varphi 1_c \mathrm{IPrem}^c g_t + \varphi 2_c \mathrm{IPrem}^c \mathrm{reg}_{c,t} + \text{six return factors as in Model(2)} + e_{c,t}$$

For $IPrem_{c,t}=b1_{c,t}$, the model excludes the factors SMB and HML; size and book-to-market ratio are controlled for in the estimation $b1_{c,t}$. $IPrem^c g_t$ and $IPrem^c reg_{c,t}$ are the monthly average of the respective premiums across all countries (global) and across the countries in the region. $IPrem^c reg_{c,t}$ is orthogonalized to $IPrem^c g_t$. The superscript c means that country c is excluded from the average when its $IPrem_{c,t}$ is the dependent variable. t-statistics are reported in parenthesis. (t-statistic)* means the t-statistics of the test that the proportion of positive/negative coefficients is different from 0.5, the chance result.

$IPrem_{c,t}$	$IPrem^c g_t$	$IPrem^c reg_{c,t}$	RMg_t	$SMBg_t$	$HMLg_t$	$RMreg_{c,t}$	$SMBreg_{c,t}$	$HMLreg_{c,t}$	R^2
$IPrem_{c,t}=IML_{c,t}$, return-weighted									
Mean	0.553	0.312	−0.145	0.092	0.028	−0.114	0.193	0.007	25.3%
(t-statistic)	(6.62)	(5.94)	(5.69)	(1.74)	(0.51)	(4.93)	(4.30)	(0.17)	
Median	0.579	0.359	−0.148	0.054	0.019	−0.105	0.157	−0.004	25.7%
Positive/negative	37/8	36/9	8/37	28/17	26/19	13/32	32/13	21/24	
(t-statistic)*	(4.32)	(4.02)	(4.32)	(1.64)	(1.04)	(2.83)	(2.83)	(0.45)	
$IPrem_{c,t}=IML_{c,t}$, value-weighted									
Mean	0.462	0.300	−0.185	0.137	0.064	−0.119	0.281	0.006	25.0%
(t-statistic)	(5.45)	(5.04)	(5.87)	(2.30)	(1.22)	(4.65)	(4.96)	(0.14)	
Median	0.498	0.284	−0.168	0.142	0.114	−0.106	0.254	0.000	22.2%
Positive/negative	36/9	36/9	6/39	27/18	26/19	10/35	35/10	22/23	
(t-statistic)*	(4.02)	(4.02)	(4.92)	(1.34)	(1.04)	(3.73)	(3.73)	(0.15)	
$IPrem_{c,t}=b1_{c,t}$									
Mean	0.309	0.072	−0.021			−0.012			7.7%
(t-statistic)	(4.23)	(1.27)	(3.39)			(2.68)			
Median	0.298	0.123	−0.016			−0.014			6.6%
Positive/negative	33/10	30/13	7/36			13/30			
(t-statistic)*	(3.51)	(2.59)	(4.42)			(2.59)			

highlight the variation over time in the severity of the risk-shifting problem inherent in the funding market for trading institutions. That is, beyond formal margin requirements, soft requirements are imposed according to market conditions, and they translate to variations in illiquidity premium.

4.1. Estimating commonality in illiquidity return premium

Our tests employ the two measures of illiquidity return premium, $IML_{c,t}$ or $b1_{c,t}$, denoted as $IPrem_{c,t}$. Their monthly global and regional cross-country averages are, respectively, $IPrem^c g_t$ and $IPrem^c reg_{c,t}$. (Countries are classified into regions as we do in constructing $RMreg_{c,t}$.) The superscript c means that country c is excluded from the average when testing commonality for that country's $IPrem_{c,t}$. $IPrem^c reg_{c,t}$ is orthogonalized by regressing it on $IPrem^c g_t$ and using the residuals (plus the intercept). We estimate for each country c a regression model, which is Model (2) augmented by the global and regional illiquidity premium factors. The regression model for $IPrem_{c,t}=IML_{c,t}$ is

$$\begin{aligned} IPrem_{c,t} = {} & \varphi 0_c + \varphi 1_c \mathrm{IPrem}^c g_t + \varphi 2_c \mathrm{IPrem}^c reg_{c,t} + \beta 1_c RMg_t \\ & + \beta 2_c SMBg_t + \beta 3_c HMLg_t + \beta 4_c RMreg_{c,t} \\ & + \beta 5_c SMBreg_{c,t} + \beta 6_c HMLreg_{c,t} + e_{c,t} \end{aligned} \tag{4}$$

Commonality in illiquidity return premium implies that $\varphi 1_c > 0$ and $\varphi 2_c > 0$. Model (4) is estimated for each country c, and the coefficients are then averaged across countries. For $IPrem_{c,t}=b1_{c,t}$, the factors SMB and HML are excluded because $b1_{c,t}$ is estimated from cross-section regressions that control for the effects of size and B/M ratio.

Table 4 presents the cross-country averages of $\varphi 1_c$ and of $\varphi 2_c$. They are all positive as expected, implying that illiquidity premiums of individual countries are driven by the global and regional illiquidity premiums. The mean $\varphi 1_c$, which measures commonality with the global illiquidity premium, is highly significant for both *IML* and $b1$. The mean $\varphi 2_c$, which measures commonality with the regional illiquidity premium (orthogonalized to the global premium), is significant for *IML* but not for $b1$. Yet for $b1$, the median $\varphi 2_c$ is much larger than its mean and, importantly, the proportion of countries with $\varphi 2_c > 0$ is significantly greater from 0.50, the chance result. That is, for a significant majority of countries $\varphi 2_c > 0$, implying that there is also regional commonality.

Consider, for example, the results for $IPrem_{c,t}=IML_{c,t}$ using return-weighted portfolio returns. The means of $\varphi 1_c$ and $\varphi 2_c$ are, respectively, 0.553 (t=6.62) and 0.312 (t=5.94). Their medians, 0.579 and 0.359, are close to the means, and the proportion of countries with these coefficients being positive are over 82% and 80% (for global and regional commonality, respectively), significantly greater than 50%, which is the chance result. The results for the value-weighted $IML_{c,t}$ are very similar. As shown in the online Appendix, we obtain similar results when all the tests in Section 4 are performed

Table 5

Decomposition of illiquid-minus-liquid (IML) portfolio returns commonality into component covariance terms.

The commonality Cov(log RP_c, log RP_m) is decomposed into four covariance terms. It is assumed that $RP = k^*x$, where RP is the risk (or illiquidity) premium, k is the per-unit price, and x is the level of risk or illiquidity:

$$\mathrm{Cov}(\log RP_c,\ \log RP_m) = \mathrm{Cov}(\log k_c + \log x_c,\ \log k_m + \log x_m) = \mathrm{Cov}(\log k_c,\ \log k_m) + \mathrm{Cov}(\log k_c,\ \log x_m) + \mathrm{Cov}(\log x_c,\ \log k_m) + \mathrm{Cov}(\log x_c,\ \log x_m)$$

Here, $RP = IML$, $k = RIML$, defined in Table 2, Panel C, and $x = RIlliq$, the relative illiquidity spread between the high-*Illiq* and low-*Illiq* portfolios. Observations are monthly and contemporaneous. The global indexes exclude country c for which the commonality is estimated, and the returns *IML* and *RIML* are replaced by 1+return because of the logarithmic transformation (the returns, which include negative values, are in decimals). The covariance values are calculated from the time series of the respective variables for each country c. The mean is calculated across the 45 countries and is multiplied by one hundred. Under the mean covariance, in brackets, is the mean correlation, calculated across the 45 countries for the respective countries' covariance values. (It is the covariance, standardized by dividing it by the product of the standard deviations of the variables.) In parentheses are t-statistics. The results are for return-weighted and value-weighted average portfolio returns.

Covariance	Mean [Mean correlation]	Correlation table			
		Cov(log $RIML_c$, log $RIML^c g$)	Cov(log $RIML_c$, log $RIlliq^c g$)	Cov(log $RIlliq_c$, log $RIML^c g$)	Cov(log $RIlliq_c$, log $RIlliq^c g$)
Return-weighted					
Cov(log IML_c, log $IML^c g$)	0.047 (15.26)	0.873	−0.133	0.216	−0.182
	[0.334]	(11.74)	(0.88)	(1.45)	(1.21)
Cov(log $RIML_c$, log $RIML^c g$)	0.005 (13.34)	1.000	−0.161	0.246	−0.000
	[0.312]		(1.07)	(1.66)	(0.00)
Cov(log $RIML_c$, log $RIlliq^c g$)	−0.003 (1.63)		1.000	−0.080	0.019
	[−0.017]			(0.53)	(0.12)
Cov(log $RIlliq_c$, log $RIML^c g$)	−0.002 (0.67)			1.000	−0.171
	[−0.010]				(1.14)
Cov(log $RIlliq_c$, log $RIlliq^c g$)	0.638 (7.05)				1.000
	[0.318]				
Value-weighted					
Cov(log IML_c, log $IML^c g$)	0.054 (15.08)	0.598	−0.127	0.079	−0.004
	[0.313]	(4.89)	(0.84)	(0.52)	(0.03)
Cov(log $RIML_c$, log $RIML^c g$)	0.007 (12.28)	1.000	0.002	−0.339	0.262
	[0.300]		(0.01)	(2.36)	(1.78)
Cov(log $RIML_c$, log $RIlliq^c g$)	0.001 (0.34)		1.000	0.170	−0.076
	[−0.001]			(1.13)	(0.50)
Cov(log $RIlliq_c$, log $RIML^c g$)	−0.002 (0.58)			1.000	−0.055
	[0.000]				(0.36)
Cov(log $RIlliq_c$, log $RIlliq^c g$)	0.634 (5.92)				1.000
	[0.260]				

using portfolios that are volume-weighted.[21] Replicating these tests for $IPrem_{c,t} = RIML_{c,t}$, the relative illiquidity return premium, we obtain similar results.

4.2. Commonality in illiquidity return premium versus commonality in illiquidity

Evidence on commonality in illiquidity in global markets is shown by Brockman, Chung, and Perignon (2009) and Karolyi, Lee, and van Dijk (2012), following earlier evidence by Chordia, Roll, and Subrahmanyam (2000) on illiquidity commonality in the US. We now test whether the commonality in illiquidity return premium across countries, which we establish, is different from the commonality in illiquidity. That is, we test whether the co-movement in illiquidity premium is due to co-movement in the level of illiquidity instead of co-movement in the price of illiquidity. We conduct two set of tests to assess this issue.[22]

Test 1 In general, a return premium RP_j can be stated as the product of a price k_j and a quantity x_j, which in this case is illiquidity. So, the covariance between the log return premium for entity j and a market-wide (m) log return premium is

$$\begin{aligned}\mathrm{Cov}(\log RP_j,\ \log RP_m) &= \mathrm{Cov}(\log k_j + \log x_j,\ \log k_m + \log x_m)\\ &= \mathrm{Cov}(\log k_j,\ \log k_m)\\ &\quad + \mathrm{Cov}(\log k_j,\ \log x_m)\\ &\quad + \mathrm{Cov}(\log x_j,\ \log k_m)\\ &\quad + \mathrm{Cov}(\log x_j,\ \log x_m) \qquad (5)\end{aligned}$$

In our context, RP=*IML*; $k = RIML$; and $x = RIlliq$, the relative illiquidity spread, which is in the denominator of *RIML*; j is country c; and m is the global market g. Given the logarithmic transformation and negative returns, we replace the returns *IML* and *RIML* by 1+*IML* and 1+*RIML* (returns are in decimals). Also, *RIlliq* here is monthly and

[21] Given the commonality in illiquidity premiums, we reestimate α_{IML} from a modified model (2) to which we add the demeaned values of $IPrem^c g_t$ and $IPrem^c reg_{c,t}$. The results are very close to those reported in Table 2. For example, for return-weighted portfolio returns, the global mean of α_{IML} is 0.791 with t=6.87.

[22] We thank the referee for suggesting these tests.

contemporaneous with the monthly returns. The monthly mean *Illiq* values are equally weighted and value-weighted for the return-weighted and value-weighted *IML*, respectively, and the global value of $RIlliq^c g_t$ is the average across countries of the country's monthly $RIlliq_{c,t}$. When estimating the commonality for country *c*, we exclude it from the corresponding global indexes.

Table 5 reports in the column "Mean" the average across the 45 countries of the covariance terms in Eq. (5) and the average of the corresponding correlations (the covariance standardized by dividing it by the product of the corresponding standard deviations).[23] We observe that the covariance of each country's *IML* (*RIML*) with the global *IML* (*RIML*) is positive for nearly all countries and their means are positive and significant. The *RIlliq* commonality, estimated by Cov(log $RIlliq_c$, log $RIlliq^c g$), is positive and significant, as shown in earlier findings on liquidity commonality (Brockman, Chung, and Perignon, 2009; Karolyi, Lee, and van Dijk, 2012). Correspondingly, the correlations of IML_c, $RIML_c$, and *RIlliq* with their own global factors are above 30% and approximately of the same magnitude, while the other two correlations (between $RIML_c$ and $RIlliq^c g$ and between $RIlliq_c$ and $IML^c g$) are practically zero. Table 5 presents the results for return-weighted and value-weighted portfolio returns. (Results for volume-weighted returns are in the online Appendix.)

Next, we test the extent of the relation between the commonality in illiquidity premium, Cov(log RP_j, log RP_m), with the commonality in the price of illiquidity, Cov(log k_j, log k_m), and in illiquidity, Cov(log x_j, log x_m). We present in Table 5 the correlations across the 45 countries between the covariance terms in Eq. (5) and ask the following question. Suppose that the commonality of IML_c with $IML^c g$, Cov(log IML_c, log $IML^c g$), is high for country *c*. Is this associated with high commonality in the country's $RIML_c$ or $RIlliq_c$ with their respective global factors? That is, is it related to higher Cov(log $RIML_c$, log $RIML^c g$) or to higher Cov(log $RIlliq_c$, log $RIlliq^c g$)?

We find that, across countries, the *IML* commonality is positively and significantly related to the commonality in the relative illiquidity return premium (*RIML*), while not being significantly related to the commonality in the relative illiquidity (*RIlliq*). That is, the primary source of the *IML* commonality is the commonality in *RIML*, not the commonality in *RIlliq*. Across countries, Cov(log IML_c, log $IML^c g$) has a high correlation of 87% with Cov(log $RIML_c$, log $RIML^c g$) for return-weighted returns (it is 60% for value-weighted returns), while its correlation with Cov (log $RIlliq_c$, log $RIlliq^c g$) is negative and statistically insignificant. Also, Cov(log IML_c, log $IML^c g$) is not significantly related to the other two covariance terms.

In summary, the commonality in the illiquidity return premium *IML* across countries is driven primarily by the commonality in the relative illiquidity premium *RIML*, and it is meaningfully distinct from the commonality in illiquidity itself.

Test 2 We estimate two models that enable us to directly assess how much of the variation in the country-level return premium of illiquidity is driven by variations in global and regional illiquidity as characteristic and how much is due to variation in the global and regional return premium on illiquidity. Model (6) augments Model (4), which we use to estimate the return premium commonality, by adding global and regional levels of illiquidity variables. Model (7) employs the variables used in Test 1, *RIML* and *RIlliq* (relative return premium and relative illiquidity), in a regression model that augments Model (4). The estimation models are:

$$\begin{aligned} IPrem_{c,t} = {} & \varphi 0_c + \varphi 1_c \mathrm{IPrem}^c g_t + \varphi 2_c IPrem^c reg_{c,t} \\ & + \varphi 3_c \log Illiq^c g_t + \varphi 4_c \log Illiq^c reg_{c,t} \\ & + \text{six return factors as in Model (4)} \end{aligned} \tag{6}$$

and

$$\begin{aligned} logIML_{c,t} = {} & \varphi 0_c + \varphi 1_c \log RIML^c g_t + \varphi 2_c \log RIML^c reg_{c,t} \\ & + \varphi 3_c \log RIlliq^c g_t + \varphi 4_c \log RIlliq^c reg_{c,t} \\ & + \text{six return factors as in Model (4)} \end{aligned} \tag{7}$$

The research question here is whether the coefficients $\varphi 1$ and $\varphi 2$, which estimate the commonality in illiquidity return premium, remain economically and statistically significant after including in the model two illiquidity variables (global and regional). The illiquidity variables are monthly, contemporaneous with the returns variables. $Illiq^c g_t$ and $Illiq^c reg_{c,t}$ are, respectively, the global and regional monthly averages of the country means of the stocks' illiquidity excluding country *c* whose $IPrem_{c,t}$ is the dependent variable.[24] $RIlliq^c g_t$ and $RIlliq^c reg_{c,t}$ are the respective relative illiquidity variables, the difference in illiquidity between $_t$he most illiquid and the most liquid portfolio, scaled by average illiquidity. *Illiq* is equally weighted (value weighted) when using $IPrem = IML$ that is return weighted (value weighted), and it is equally weighted for $IPrem = b1$, the coefficient of stock illiquidity in Fama-MacBeth regressions. Because $b1$ is estimated after controlling for size and B/M ratio, we include in this regression only the return factors RMg_t and $RMreg_{c,t}$. In Model (7), the returns *IML* and *RIML* are replaced by (1+return) because of the logarithmic $_t$ransformation.

In Model (6) we examine whether the coefficients $\varphi 1$ and $\varphi 2$ are lower in magnitude than those estimated in Model (4) and reported in Table 4, after having added here the global and regional contemporaneous illiquidity variables. The results in Table 6, Panel A, show that this is not the case.[25] The means of $\varphi 1_c$ and $\varphi 2_c$ are similar — both in magnitude and in statistical significance — to those reported in Table 4 for Model (4). For $IPrem = IML$, the coefficients of both global and regional premiums remain positive and highly significant. For $IPrem = b1$, the coefficient of the global illiquidity premium is positive and highly significant and that of the regional premium is

[23] The use of (1+return) in the logarithmic transformation of returns reduces the variance and covariance of *IML* and *RIML* relative to that of *RIlliq*, whose covariance is large relative to that of the returns *IML* and *RIML*. This helps explain why the covariance values do not add up.

[24] The regional series is orthogonalized to the global series as we do with the regional return factors.

[25] To save space, we report only the coefficients of the variables under study — $IPrem^c g_t$, $IPrem^c reg_{c,t}$, $logIlliq^c g_t$, and $logIlliq^c reg_{c,t}$ — omitting the coefficients of the other global and regional return factors.

Table 6
Commonality in illiquidity return premium: controlling for illiquidity.
Panel A presents estimation results of Model (4) as in Table 4 (see explanation in the legend there), augmented by $Illiq^c g_t$ and $Illiq^c reg_{c,t}$, the monthly global and regional illiquidity, respectively:

$$IPrem_{c,t} = \varphi 0_c + \varphi 1_c IPrem^c g_t + \varphi 2_c IPrem^c reg_{c,t} + \varphi 3_c \log Illiq^c g_t + \varphi 4_c \log Illiq^c reg_{c,t} + \text{six return factors as in Model (2)}$$

For $IPrem=IML$ which is return-weighted (value-weighted), we use *Illiq* that is equally weighted (value-weighted), and for $IPrem=b1$, we use equally weighted *Illiq*.
Panel B presents estimation results of the model

$$\log IML_{c,t} = \varphi 0_c + \varphi 1_c \log RIML^c g_t + \varphi 2_c \log RIML^c reg_{c,t} + \varphi 3_c \log RIlliq^c g_{c,t} + \varphi 4_c \log RIlliq^c reg_{c,t} + \text{six return factors as in Model (2)}$$

RIML is the relative *IML*, defined in Table 2, Panel C, and *RIlliq* is the relative illiquidity, defined in Table 5. Returns are replaced by 1+return because of the logarithmic transformation. The weighting method of the variables *RIML* and *RIlliq* in each regression corresponds to the weighting method of *IML*. Both panels present the means of the coefficients estimated from country-by-country time series regressions.

Panel A: Dependent variable: $IPrem_{c,t}$

$IPrem_{c,t}$	$IPrem^c g_t$	$IPrem^c reg_{c,t}$	$\log Illiq^c g_t$	$\log Illiq^c reg_{c,t}$
$IPrem_{c,t}=IML_{c,t}$, return-weighted				
Mean	0.524	0.307	−0.438	−0.543
(t-statistic)	(6.18)	(5.77)	(1.96)	(1.80)
Median	0.560	0.360	−0.126	−0.095
Positive/negative	37/8	36/9	18/27	19/26
(t-statistic)*	(4.32)	(4.02)	(1.34)	(1.04)
$IPrem_{c,t}=IML_{c,t}$, value-weighted				
Mean	0.440	0.302	−0.275	−0.387
(t-statistic)	(5.18)	(4.94)	(1.82)	(1.59)
Median	0.489	0.281	−0.068	−0.194
Pos/Neg	36/9	36/9	21/24	16/29
(t-statistic)*	(4.02)	(4.02)	(0.45)	(1.94)
$IPrem_{c,t}=b1_{c,t}$				
Mean	0.326	0.073	0.028	−0.006
(t-statistic)	(4.22)	(1.21)	(0.41)	(0.09)
Median	0.319	0.096	−0.008	−0.062
Positive/negative	35/8	31/12	20/23	15/28
(t-statistic)*	(4.12)	(2.90)	(0.46)	(1.98)

Panel B: Dependent variable: $\log IML_{c,t}$

$\log IML_{c,t}$	$\log RIML^c g_t$	$\log RIML^c reg_{c,t}$	$\log RIlliq^c g_t$	$\log RIlliq^c reg_{c,t}$
Return-weighted $\log IML_{c,t}$				
Mean	1.462	0.841	0.016	0.006
(t-statistic)	(6.09)	(5.86)	(1.93)	(0.73)
Median	1.739	0.799	0.008	0.006
Positive/negative	36/9	36/9	27/18	26/19
(t-statistic)*	(4.02)	(4.02)	(1.34)	(1.04)
Value-weighted $\log IML_{c,t}$				
Mean	1.203	0.804	0.018	0.012
(t-statistic)	(5.29)	(5.51)	(1.63)	(1.29)
Median	1.384	0.738	0.009	0.012
Positive/negative	37/8	36/9	24/21	24/21
(t-statistic)*	(4.32)	(4.02)	(0.45)	(0.45)

positive but insignificant. Yet, the latter coefficient is again positive for 72% of the countries, significantly greater than the chance result of 50% ($p<0.01$).[26]

In a robustness test, we replace the two illiquidity variables in Model (6) by $\Delta\log Illiq^c g_t$ and $\Delta\log Illiq^c reg_{c,t}$, the changes in $\log Illiq^c g_t$ and $\log Illiq^c reg_{c,t}$. We obtain similar results. The coefficients $\varphi 1$ and $\varphi 2$ remain similar in magnitude and statistical significance to those reported in Table 4.

[26] The coefficients of $logIlliq^c g_t$ and $logIlliq^c reg_{c,t}$ are negative because the illiquidity beta is more negative for more illiquid stocks (see Pastor and Stambaugh, 2003; and Acharya and Pedersen, 2005). Here, the dependent variable is the return on illiquid-minus-liquid stocks so its illiquidity beta should be negative. However, the means of these coefficients are insignificantly different from zero (or are weakly significant), and the proportion of negative values for these coefficients are not significantly different from 0.50, the chance result.

Model (7), which uses the variables employed in Test 1, enables us to examine whether the variation in *IML* is due to variation in the global relative return premium $RIML^c g_t$ or due to variation in the global relative illiquidity $RIlliq^c g_t$ (the same question applies to the regional factors). Notably, the numerators of $\varphi 1_c$ and $\varphi 3_c$ are, respectively, Cov(log $IML_{c,t}$, log $RIML^c g_t$) and Cov(log $IML_{c,t}$, log $RIlliq^c g_t$), which are examined in Test 1, and the coefficients $\varphi 2_c$ and $\varphi 4_c$ reflect the covariance terms with the respective regional factors.

The results in Panel B of Table 6 are consistent with those obtained in Panel A of Table 6. The variation in a country's IML_c is primarily due to variations in the global and regional return premiums $RIML^c g$ and $RIML^c reg_c$, whereas the effects of global and regional relative illiquidity are either borderline significant or statistically insignificant. For the return-weighted portfolio returns, the coefficient $\varphi 1$ of log $RIML^c g$ is 1.462 (t=6.09) with the median, 1.739, being even higher, and the proportion of positive coefficients significantly exceeding 0.50, the chance result. Yet the coefficient $\varphi 3$ of log $RIlliq^c g$ is 0.016 (t=1.93), the median is half that size (0.008), and the proportion of positive coefficients is not significantly different from 0.50, the chance result. For the value-weighted portfolio returns, the statistical significance of $\varphi 3$ is even weaker. And, while the regional factor log $RIML^c reg_c$ has a positive and highly significant coefficient ($\varphi 2$), the coefficient of the regional illiquidity variable *RIlliq* ($\varphi 4$) is insignificantly different from zero.

It follows that the commonality of *IML* is primarily with the global return premium on illiquidity, not with illiquidity itself. We conclude that the commonality in illiquidity return premium, which we establish, is different from and is not driven by the commonality in illiquidity itself.

4.3. *Market openness and commonality in illiquidity return premium*

We provide two tests of whether the commonality in illiquidity return premium is affected by capital market integration and market openness, which facilitate capital flows into and out of a country and thus create contagion in illiquidity premium shocks.

1. A test of whether commonality in illiquidity return premium is greater in markets with greater access of foreign investors.
2. A test exploiting a natural experiment: the adoption of the euro as a common currency by some countries in Europe. We test whether this adoption increased the commonality in illiquidity return premium among the European markets.

4.3.1. *The effect of market openness*

To test for the effect of market openness, we define a dummy variable $Open_{c,t}$, which equals one if the ratio of foreign investors' shareholding (out of the total market capitalization in the country) equals or exceeds the median value of this ratio for all countries at the beginning of each year. The foreign investor holdings data are available for 12 years, 1999 – 2010, obtained from Factset. Model (4) is then augmented by the interaction variable $IPrem^c g_t {*} Open_{c,t}$ and $Open_{c,t}$. We also include $RMg_t {*} Open_{c,t}$ to control for the effect of global market returns, which is associated with market openness. We expect the coefficient of $IPrem^c g_t {*} Open_{c,t}$ to be positive if the commonality in illiquidity premium is stronger in capital markets that are more open to foreign investors.

The estimation is done by a panel regression with country and year fixed effects. The standard errors are clustered by country and year. For $IPrem_{c,t}$, we use $IML_{c,t}$, the premium on illiquidity-based portfolios, and $b1_{c,t}$, the measure obtained from cross-sectional regression coefficients using individual stock illiquidity. To save space, we do not report the coefficients of the common return factors.

Table 7, Panel A, presents the estimation results. Consistent with our prediction, the coefficient of $IPrem^c g_t {*} Open_{c,t}$ is positive and significant across all illiquidity premium measures. This implies greater commonality of $IPrem_{c,t}$ with the global illiquidity premium $IPrem^c g_t$ in markets that are more open to foreign investors. The coefficient of $IPrem^c g_t {*} Open_{c,t}$ is significantly greater than that of $IPrem^c g_t$, implying that the extent of commonality of illiquidity premium more than doubles in markets with above-median openness. For example, the coefficient of $IPrem^c g_t$ in the return-weighted $IML_{c,t}$ is 0.137, and it increases by 0.699 for markets with above-median openness to foreign investment. This implies that commonality in *IPrem* is much greater in open markets. The results are robust to the weighting method used in computing $IML_{c,t}$. The results are also similar when the illiquidity premium is measured by $b1_{c,t}$. When adding to the model an interaction variable $IPrem^c reg_{c,t} {*} Open_{c,t}$, its coefficient is also positive, but its magnitude and statistical significance are smaller than those of $IPrem^c g_t {*} Open_{c,t}$. Notably, the greater co-movement of $IPrem_{c,t}$ with $IPrem^c g_t$ in open markets is observed after controlling for $RMg_t {*} Open_{c,t}$, meaning that the greater commonality in illiquidity return premium is not driven by global market return. Also, the negative coefficient of $Open_{c,t}$ implies that the level of illiquidity premium is slightly lower in open markets. This finding is significant only when $IPrem_{c,t}$ is proxied by $b1_{c,t}$. We replicate these tests for $IPrem_{c,t}$=$RIML_{c,t}$, the relative illiquidity return premium and obtain results that are very similar to those reported for $IML_{c,t}$.

4.3.2. *The effect of the adoption of the euro*

We examine whether the adoption of the euro, which helped integrate the affected markets, increased the commonality in illiquidity return premium. Hardouvelis, Malliaropulos, and Priestley (2006) show that stock market integration has increased following the adoption of the euro and the associated harmonization in regulation and economic policies. Cappiello, Kadareja, and Manganelli (2010) report that the co-movement in country and industry index returns increased after the countries adopted the euro. Bekaert, Harvey, Lundblad, and Siegel (2013) find that differences between countries in their industry earnings yields are lower if both countries are European Union (EU) members, showing that EU membership increases the financial and economic integration.

We set a dummy variable $Euro_{c,t}$ to equal one in year t and thereafter if country c has adopted the euro in year t

Table 7
The effects of market openness and of market integration on commonality in illiquidity return premium.
In Panel A, we augment the commonality regression model in Table 4 as

$$IPrem_{c,t} = \varphi 0_c + \varphi 1_c IPrem^c g_t + \psi 11_c IPrem^c g_t {*} Open_{c,t} + \psi 12_c RMg_t {*} Open_{c,t} + \psi 13_c Open_{c,t} + \varphi 2_c IPrem^c reg_{c,t} + \text{six return factors as in Model (2)} + e_{c,t}.$$

The illiquidity premium for country c in month t, $IPrem_{c,t}$, is represented by one of the following two measures: $IML_{c,t}$ (return-weighted or value-weighted), the return on illiquid stock portfolio minus the return on liquid stock portfolio, and $b1_{c,t}$, the Fama-MacBeth regression coefficient associated with the stock-level illiquidity. The dummy variable $Open_{c,t}$ equals one if the ratio of foreign investors' holdings in country c to the total market capitalization is at or above the median value of this ratio among all countries at the beginning of each year. All other variables are defined in Table 2.
In Panel B, we modify the regression model as

$$Prem_{c,t} = \varphi 0_c + \varphi 1_c IPrem^c g_t + \varphi 2_c IPrem^c reg_{c,t} + \lambda 11_c Euro_{c,t} {*} IPrem^c reg_{c,t} + \lambda 12_c Euro_{c,t} {*} RMreg_{c,t} + \lambda 13_c Euro_{c,t} + \text{six return factors as in Model (2)} + e_{c,t}.$$

The dummy variable $Euro_{c,t}$ equals one after country c has adopted the euro in that year and thereafter, and it is zero otherwise. The estimation is by panel regressions with year and country fixed effects. This table excludes Germany. The table presents the estimated coefficients and their t-statistics (in parentheses). Standard errors are clustered by country and year. The coefficients associated with the six common factors (global and regional) are not reported to save space.

Panel A: The effect of open markets on global commonality

IPrem	$IPrem^c g_t$	$IPrem^c g_t {*} Open_{c,t}$	$RMg_t {*} Open_{c,t}$	$IPrem^c reg_{c,t}$	$Open_{c,t}$	R^2
IML, return-weighted	0.137 (1.72)	0.699 (5.05)	0.179 (2.98)	0.155 (4.05)	−0.378 (1.51)	15%
IML, value-weighted	0.056 (0.66)	0.589 (4.35)	0.153 (2.35)	0.136 (2.80)	−0.043 (0.17)	14%
*b*1	0.126 (1.23)	0.391 (2.82)	0.011 (1.41)	0.069 (2.02)	−0.063 (2.29)	6%

Panel B: The effect of the adoption of the euro on regional commonality

$IPrem_{c,t}$	$IPrem^c g_t$	$IPrem^c reg_{c,t}$	$Euro_{c,t} {*} IPrem^c reg_{c,t}$	$Euro_{c,t} {*} RMreg_{c,t}$	$Euro_{c,t}$	R^2
ML, return-weighted	0.442 (8.19)	0.199 (5.81)	0.231 (2.62)	−0.006 (0.08)	−0.214 (0.65)	13%
IML, value-weighted	0.350 (6.09)	0.202 (4.82)	0.263 (2.29)	−0.129 (1.67)	0.102 (0.32)	12%
*b*1	0.242 (4.37)	0.025 (0.84)	0.229 (2.23)	0.008 (0.85)	−0.046 (1.26)	4%

(zero otherwise). Nine European countries adopted the euro in 1999: Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Portugal, and Spain; Greece and Cyprus joined in 2001 and 2008, respectively. These 11 countries constitute half of the 22 countries defined as members of the European region in our sample. We augment Model (4) by adding to it the variables $Euro_{c,t}$, $Euro_{c,t} {*} IPrem^c reg_{c,t}$ and $Euro_{c,t} {*} RMreg_{c,t}$.[27] The model is estimated in a panel regression with year and country fixed effects and with standard errors clustered by both country and time. We exclude Germany, which has very few observations before the introduction of the euro.[28]

The estimation results are in Panel B of Table 7. The mean coefficient of $Euro_{c,t} {*} IPrem^c reg_{c,t}$ is positive and significant across all measures of illiquidity return premium, implying an increased commonality of illiquidity premium in the European region after the adoption of the euro.[29] The coefficient of $Euro_{c,t} {*} IPrem^c reg_{c,t}$ underestimates the increase in commonality because only part of the euro countries that are included in the respective regional index of these countries ($IPrem^c reg_{c,t}$) adopted the euro, though they are among the most important ones. The illiquidity premium commonality is not driven by the overall stock market return, as evident from the insignificant coefficient of $Euro_{c,t} {*} RMreg_{c,t}$, and is different from the effects of co-movement in stock market returns shown in Hardouvelis, Malliaropulos, and Priestley (2006) and others. Replicating these tests for $IPrem_{c,t} = RIML_{c,t}$, the relative illiquidity return premium, we obtain very similar results.

If the markets that adopted the euro are integrated, the return premium per unit of illiquidity should be the same across them. After 1999, no significant difference exists between the α_{RIML} coefficients for any pair of countries among the nine that joined the euro. We regress the differential relative illiquidity premium $RIML_{j,t} - RIML_{k,t}$ for the pair of countries j and k on the three global risk factors and the global *RIML* factor (the average of all countries' *RIML*.) In none of these regressions is the intercept significantly different from zero.

In summary, we observe considerable co-movement in illiquidity return premium across countries, which is significantly higher in countries that are more open to foreign capital flows. Consistent with this finding, the introduction of the euro as a common currency in some European countries increases their regional illiquidity premium commonality. Indications also exist, although the evidence is statistically weaker, of a decline in the level of illiquidity premium as the uniform currency or more open equity markets facilitate greater cross-country capital flows.

[27] The countries that adopted the euro all belong to the region defined as Europe and developed.

[28] Datastream does not report volume data for many German stocks before the introduction of the euro.

[29] The coefficients of $Euro_{c,t} {*} IPrem^c reg_{c,t}$ are larger and more significant when Germany is added. If we eliminate both Germany and Belgium (the latter has two years of data before the adoption of the euro), then, for the remaining seven countries, the coefficient of $Euro_{c,t} {*} IPrem^c reg_{c,t}$ becomes 0.229 (t=2.37) for the return-weighted *IML* and 0.283 (t=2.26) for $b1$.

5. Conclusions

This study provides comprehensive evidence that stock illiquidity is priced in the great majority of international equity markets. The portfolio of the most illiquid stocks generates significantly higher risk-adjusted return than the portfolio of the most liquid stocks. The differential risk-adjusted monthly return on illiquid stocks is 0.82% for return-weighted portfolios, after controlling for the six global and regional common risk factors (the market, size, and value factors). For value-weighted portfolios, the risk-adjusted illiquidity monthly premium is 0.45%, and statistically significant; for volume-weighted portfolio monthly returns, the risk-adjusted illiquidity premium is a statistically significant 0.73%. The illiquidity return premium is higher in emerging markets than it is in developed markets. We obtain a positive and significant risk-adjusted mean for the relative illiquidity premium, which is the country's illiquidity return premium scaled by the relative illiquidity spread, defined as the difference between the high and low illiquidity portfolios divided by average illiquidity. We also find a positive and significant illiquidity premium when it is measured by cross-sectional Fama-MacBeth regressions of individual stock returns on stock illiquidity controlling for other firm characteristics, following Amihud and Mendelson (1986) and Amihud (2002).

We present a new type of commonality between illiquidity return premiums across countries. A country's illiquidity premium co-varies positively and significantly with the global and regional illiquidity premium factors after controlling for its covariance with global and regional risk premium factors. This commonality in illiquidity return premium is not driven by, and is distinct from, common variations in the level of global illiquidity.

The commonality in illiquidity return premium is stronger in markets that are financially integrated with other markets or in countries whose equity markets are more open to foreign investments. Exploiting the event of the introduction of euro as a common currency among some leading European countries, which helped integrate their capital markets, we find that, following this event, the affected countries (those that joined the Eurozone) exhibit greater regional co-movement in their illiquidity return premiums.

In summary, we find a significant positive return premium for stock illiquidity in international equity markets and a new commonality pattern in this illiquidity premium across countries.

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.jfineco.2015.04.005.

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