

Article

Currency Denomination and The Cross-Country Comparison of Stock Market Liquidity

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Abstract: The Amihud illiquidity ratio is commonly used to compare the liquidity of the equity markets of different countries. However, it is not invariant to the unit of account in which volume is measured. The paper formalizes the problem and measures it using a hand-collected panel data set including 1,098 firm-year observations on 100 listed firms in Uzbekistan, Türkiye, Poland and South Korea during the period 2015-2025. Because the Amihud ratio is an absolute return and a quantity of money, it is in inverse currency. The log form thus contains an exchange rate term, common to all firms quoted in the same market in the same year, to be added. Country indicators explain 78.9 per cent of log Amihud ratio variance, and 79.7 per cent of log turnover variance. By contrast, the share of exchange sessions with no trades and the share of zero-return days (both constructed from daily data) explain only 50.0 per cent and 46.4 per cent, respectively. This additional variance is not liquidity but denomination, and the answer to one research question depends on the liquidity measure. In pooled estimation, ownership concentration increases illiquidity on all four measures. Adding country and year fixed effects does not change the relative advantages of these measures. The currency-denominated measures retain a positive effect while the dimensionless measures become statistically indistinguishable from zero. Cross-country liquidity papers should report at least one dimensionless measure alongside the currency-denominated measure since both can be constructed from the same daily data set at no additional cost.

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1. Introduction

Liquidity does not have direct measures. Rather, it is inferred by examining price and volume traces left by trading. Converting those traces into a number to express liquidity is itself a modeling decision with consequences. The exercise examines the slope between order inflow and the evolution in price against traders placing the order. The slope between order inflow and price change gives a good measure of the market's depth [1]. These transaction costs are widely considered a priced characteristic: the traditional view is that securities with high transaction costs must provide higher gross returns to compensate their holders [2]. The measure that has guided most of this literature is the illiquidity ratio of Amihud, which is defined as the average over the holding period of the ratio of the daily absolute return to daily value traded [3]. Its main attraction is that all it requires is daily prices and daily volumes (which are available for almost every exchange in the world for almost every year). Therefore, it extends to samples in which quote-level data is unavailable, expensive or simply never assembled. The turnover ratio (the ratio of

value traded to market capitalisation) has served a similar purpose in the asset-pricing literature [4]. A sizable amount of validation literature found that the Amihud ratio performs well, with regards to the benchmark, when the effective spreads and price impacts from intraday data are used, either in the case of United States equities [5], [6] or more broadly across an international cross-section [7]. That validation, however, has almost always been carried out inside a single market quoting in a single currency, and the measure has been transplanted into places where it was never tested: comparisons between markets quoting in different units of account. The same has happened with the world price of liquidity risk [8], commonality in country-level liquidity [9], and the international illiquidity premium [10], that all quote the Amihud ratios computed in won, zloty, lira and dollars in a common empirical template. It is worth noting that the problem is not limited to descriptive statistics, but the regression coefficients themselves are the product of the transplant. This is a problem which has been known for some time: Griffin, Kelly and Nardari have shown that measures of market efficiency which behave sensibly within developed markets can produce the wrong ordering when applied mechanically to emerging markets, because the statistical properties that the measure relies upon do not travel [11]. The present paper makes the analogous point for liquidity, but the mechanism it identifies is simpler and, for that reason, harder to argue with.

The mechanism is dimensional. An absolute return is a number without dimension (the ratio of two prices in the same currency, hence the currency cancels). The value traded is not a pure number, but an amount of money that depends on the currency in which the exchange keeps its books. The ratio of the first and the second has dimensions of the inverse currency units, and therefore the logarithm contains an additive term which depends on the exchange rate. This term has no liquidity content whatsoever. This means that it varies across markets according to the level at which each currency happens to trade, and it varies within a market as the currency appreciates or depreciates. If Amihud levels across currencies are compared, or if present regressions pool observations from markets quoting in different currencies, the estimates will be biased unless the specification is adapted to account for the difference. The new element is not that the firms are traded in different units, but that they must be, as that is how we set up the problem. And they are, spanning four exchanges spread as far as is feasible on listed equity markets, from the Korea Exchange to the Republican Stock Exchange "Toshkent" (where the average sample firm was not traded on 44.7 per cent of exchange sessions). Yet the difference in mean log Amihud ratios between Korea and Uzbekistan is 14.85 log points, or a factor of about 2.8 million, and no account of liquidity that anyone would defend implies a gap of that order between two venues on which shares of real, operating companies trade. Within this context, we derive the fixed-effect specifications that eliminate, partially eliminate, and leave unaffected the currency term. We compute the amount of between-country variation in the full set of candidate measures as a ratio of the total variation. We show how the choice of measures can change the answer to a standard research question, rather than just change the level of the standard error. And it provides two dimensionless measures, both of which should be easy to compute from the daily files already available.

Furthermore, these two alternatives are not inventions of this paper, and the share of trading days on which a security records no transaction describes the wide-ranging margin of liquidity directly. The zero-return measure of Lesmond, Ogden and Trzcinka [12], modified for emerging market applications in Lesmond [13], and used as the headline liquidity measure in Bekaert, Harvey and Lundblad [14] corresponds to the share of days for which no price movement is measured. Being a ratio of counts, it should not change with the unit of account. For instance, data from the Warsaw Stock Exchange reveals that proxies of liquidity among different families can vary considerably for the same security [15]. Therefore, the discord mentioned above is valuable, not inconvenient. The argument clearly holds for other unit-free proxy estimates based on daily data, including the high-low spread estimate of Corwin and Schultz [16]; the choice of the pair here is arbitrary.

2. Materials and Method

A security's Amihud illiquidity ratio over a period is equal to the absolute value of the return over that period divided by the value traded over the same period. The return is a pure number and the value traded is measured in the local unit of account. Let E be the exchange rate, or the price of one unit of numeraire in units of the domestic currency, then the value traded in the local currency is E times the value traded in numeraire. The logarithm of the ratio is written as $\ln \text{ILLIQ} = \ln |r| - \ln V - \ln E$ where $|r|$ is the return, and V is the volume denominated in the numeraire. The first two terms become fixed parameters of the security and of the market on which it is traded. The third is common only to the currency, and has the same value for all firms listed on any market in a given year. It only varies from market to market with the level of the exchange rate, and from year to year with the evolution of the currency.

The high-dimensional fixed effects structure determines exactly what each specification can and cannot absorb. The currency term is constant within cells defined by market-year, so it is absorbed by country-by-year fixed effects. Country fixed effects remove that average on a within-market basis, but not its drift. Country and year fixed effects remove the drift only to the extent that they are common across markets, which they manifestly are not during the years covered here: the path of the Uzbek som, the Turkish lira, the zloty and the won against the dollar looks very different from 2015 to 2025. What survives in that last case nonetheless does not vary across firms within a market-year, so it cannot contaminate a coefficient that is identified purely from differences between firms observed in the same market and the same year. The implication is that a within-market design is safe while a cross-market comparison of levels is not, which is an uncomfortable conclusion because the cross-market comparison is very often the reason for assembling a multi-country panel in the first place.

Two additional liquidity measures are constructed from the same daily price files but are unit of account independent. The first of these measures is the fraction of the exchanges' sessions in the year in which the firm has zero number of transactions. The second dimension of trading continuity is the percentage of trading days when the return is exactly zero, the measure of Lesmond, Ogden and Trzcinka [12] of trading discontinuity adjusted to emerging markets [13] and applied in the cross-country analysis by Bekaert, Harvey and Lundblad [14]. Since both are ratios of counts to counts, they are denomination-invariant by construction. Log turnover is also retained, allowing this measure to compare two families of measures, rather than comparing a measure to its two alternatives.

We selected a sample of the 100 largest (by market capitalisation) firms listed on each of the four exchanges from 2015 to 2025, for a total of 1,098 firm-year observations, and collected daily prices and volumes from each of the exchanges. Ownership data are hand-collected from the issuer disclosure filings. This is the binding constraint on our sample size, which is why the panel is not larger. Each liquidity measure is regressed on ownership concentration (concentrated ownership is measured as the Herfindahl-Hirschman index of disclosed holdings), log of size, leverage, return on assets, country and year fixed effects, and standard errors clustered at the firm level following Petersen [17]. Ownership concentration is not of independent interest. It is employed because a large literature has established its reduction of liquidity, through the reduction of the free float and through the informational disadvantage it imposes on uninformed traders [18] [19][20]; thus, the sign of the relation is not in dispute, and any disagreement in the measures can be attributed to the measures, rather than to the economics..

3. Results

Table 1 shows the four measures by market and the share of the variance explained by the country indicators. The mean log Amihud ratio ranges from 0.21 in Uzbekistan to

-14.64 in South Korea. Dimensionless measures such as these give some indication of the experience of trading on these venues. Uzbek firms do not trade on almost half (44.7 per cent) of exchange sessions. In addition, as can be seen in column 3, out of the sessions in which they do trade, an additional 32.5 per cent yield no return. In Türkiye, those percentages are 0.1 per cent and 3.2 per cent, in Poland 1.0 per cent and 3.8 per cent and in South Korea 0.8 per cent and 6.1 per cent. It sometimes is true that a stock which does not trade at all on about half of all trading days poses a different problem to an investor than one which has a somewhat high price impact per unit of volume.

Table 1. Liquidity measures by market and the share of their variance explained by country indicators

Measure	Uzbekistan	Türkiye	Poland	South Korea	R ² country
ln(Amihud illiquidity)	0.21	-8.71	-6.22	-14.64	0.789
Log turnover	15.12	19.47	16.32	24.57	0.797
Sessions without a trade	0.447	0.001	0.010	0.008	0.500
Zero-return days	0.325	0.032	0.038	0.061	0.464

Note: cell entries are means over the firm-years for which the measure exists. The last column reports the R² from a regression of the measure on country indicators alone. The Amihud ratio and turnover are in local currency and are not comparable across markets in levels.

We see that country effects explain 78.9 per cent of the variation of the log Amihud ratio itself, and 79.7 per cent of the log turnover, relative to 50.0 per cent and 46.4 per cent for the dimensionless measures. Thus even the dimensionless measures are close to half country; the true cross-market differences in liquidity are indeed very large. The currency-denominated measures are a great deal more country than that, and the excess is denomination rather than liquidity. The most obvious symptom is an inversion in the ranking of the four markets. In order of most to least illiquid, Uzbekistan, Poland, Türkiye, and South Korea for the Amihud ratio; Uzbekistan, Poland, South Korea, and Türkiye for the share of sessions with no trades. Türkiye is the second most illiquid market using the Amihud ratio, and the most liquid market using both dimensionless measures. For the two measures constructed for those files, for those firms, for those years, however, the easiest exchange on which to trade varies between these exchanges. Pooled estimates of table 2 show that ownership concentration increases the log Amihud ratio by 13.73 and decreases the turnover ratio by 9.16. It also increases the share of sessions without a trade by 31.1 percentage points and increases the share of sessions with zero return by 21.2 percentage points. The coefficients are meaningful at the 1 per cent level. When both country fixed effects and year fixed effects are added, the Amihud coefficient falls by four-fifths, to 2.81, which is still important at the one per cent level. The turnover coefficient falls by three-quarters, to -1.54. The two dimensionless coefficients display much more variability: they fall to approximately zero and flip sign to -0.002 and -0.026, respectively; neither coefficient is statistically distinguishable from zero. In essence, if only Amihud regressions are reported, concentrated ownership hampers liquidity; if only zero-return regressions are reported, it does not. They would both be reading the same panel.

Table 2. Effect of ownership concentration on four liquidity measures, with and without fixed effects

Specification	ln(Amihud)	Log turnover	No trade	Zero return
Pooled OLS	13.73*** (1.56)	-9.16*** (1.29)	0.311*** (0.080)	0.212*** (0.046)

Specification	ln(Amihud)	Log turnover	No trade	Zero return
Country and year fixed effects	2.81*** (0.83)	-1.54** (0.67)	-0.002 (0.045)	-0.026 (0.038)
Standardised effect (fixed effects)	+0.121***	-0.083**	-0.002	-0.048
Observations	847	849	849	849

Note: standard errors clustered by firm in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. All specifications include firm size, leverage and return on assets. The standardised effect is expressed in standard deviations of the outcome per standard deviation of concentration.

These effects are plotted in figure 1, with their 95 per cent confidence intervals, and clearly show the difference between each family. In a specification that re-estimates the model with country by year fixed effects and drops the currency term exactly, the coefficient on log Amihud ratio is 2.731 (standard error 0.767). When country and year effects are entered separately, the coefficient is 2.808 (standard error 0.832).

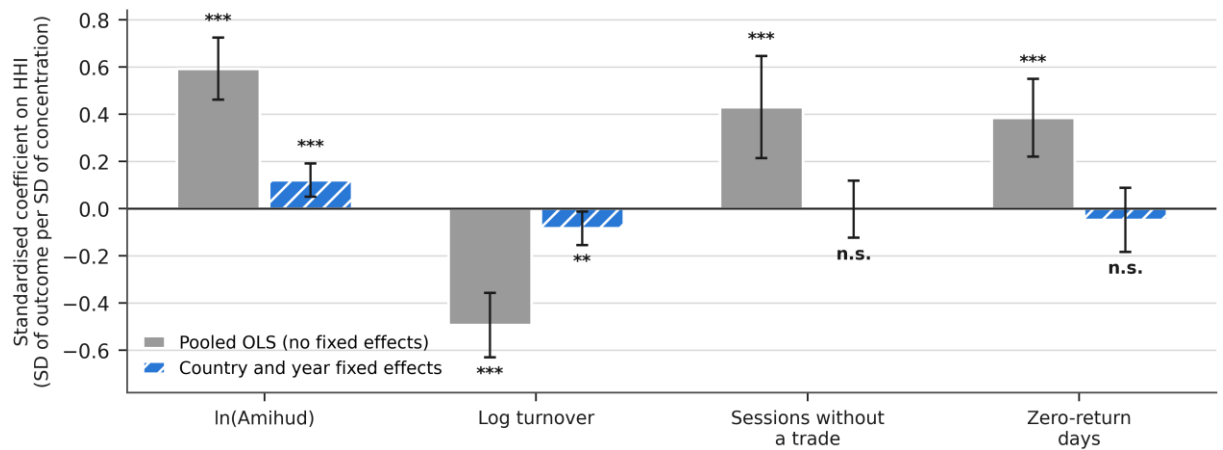


Figure 1. Standardised effect of ownership concentration on four liquidity measures, with and without country and year fixed effects, with 95 per cent confidence intervals.

All dimensionless coefficients are still indistinguishable from zero, meaning that the residual currency term leftover from the separable specification in this sample is not meaningful. It is worth stressing this because the divergence of the measure families does not appear to be an artifact of incomplete absorption. The results of the subsequent analysis are strong to clustering by country, to clustering by year, to using a one-year lag of the regressor, to dropping each control in turn, and to dropping Uzbekistan, the market with the worst trading record, from the sample.

4. Discussion

Our second conclusion from Table 2 is that the relationship between concentration and illiquidity is overwhelmingly between-country. Concentrated ownership and poor liquidity travel together mainly because the markets that have concentrated ownership are the markets that have poor liquidity, not because concentrated firms within a given market are harder to trade than their neighbors. One is that, in the pooled data, the firm level effect on quantity traded is roughly five times too large in magnitude and the effect on price is statistically zero. The other is that within a given market-year and controlling for country effects, a more concentrated firm has a larger effect on price for unit of volume traded and lower net turnover, but does not matter for whether a trade occurs. The main finding is

the internal consistency; concentration withdraws shares from the float, increasing the price impact of a given order, without preventing the security from trading at all.

This points to another issue that measurement debate tends to obscure: liquidity is not a single quantity. The Amihud ratio and turnover speak to the cost of a trade. The share of non-trading days and the share of zero-return days are questions of whether a trade happens. In deep markets the second question is close to trivial, since everything trades every day and the wide-ranging margin carries almost no information; in frontier markets it is very nearly the whole of the problem. The asymmetry explains the reason why these two families of measures are maximally precise under different conditions, and why reporting both is more informative than choosing one of them arbitrarily. The claim, though, is only a limited one. It is not this that is being claimed, and so it is worth mentioning that the Amihud ratio is not a bad measure of liquidity. That said, the relationship appears to be stable across all of the measures referred to above, making this ratio the obvious choice for a question that lives within one market, one currency. What it is not is portable across units of account. The fixed effects that restore the within-market comparison are the same ones that destroy the cross-market comparison that was the motivation for the multi-country design in the first place. Nor are the two dimensionless measures generally superior. Both are coarse, and both lose almost all of their resolution when every security trades every day, which is the normal condition in developed markets. What they offer is a comparison that is valid between exchanges.

Three limitations need consideration: the currency term is never directly measured, the exchange rate series is not collected simultaneously with the panel, and the term can only be inferred by absorbing it. Further, the panel consists of only four markets, which is a small number of clusters for inferring cross-country variation. Moreover, ownership variables are imperfectly matched across regimes, and the sample is overwhelmingly made up of the largest firms in each market, which, if anything, underestimates the severity of the trading continuity problem in smaller markets. Subject to those caveats, nonetheless the standard should be that any cross-country liquidity comparison includes at least one dimensionless measure alongside whichever currency-denominated measure is preferred, since one can be constructed from the same daily price files without additional data costs. Where both studies agree, the conclusions are strong to the measurement problem described here. The areas of disagreement are informative in their own right, telling us the margin of liquidity the finding actually pertains to, not the margin it is often thought to pertain to.

5. Conclusion

This study concludes that currency denomination is an important consideration in cross-country comparisons of stock market liquidity. The results show that currency-denominated measures such as the Amihud ratio and turnover contain substantial country-level variation, while dimensionless measures provide more comparable information across markets. Ownership concentration is also associated with greater illiquidity, particularly through higher price impact and lower turnover. Therefore, cross-country liquidity studies should use both currency-denominated and dimensionless measures to provide a more comprehensive comparison.

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