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Do firms issue more equity when markets become more liquid?

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Abstract

Using quarterly data on IPOs and SEOs for 37 countries from 1995 to 2014, we show that changes in equity issuance are positively related to lagged changes in aggregate local stock market liquidity. This relation is as economically significant as the well-known relation between equity issuance and lagged stock returns. It survives the inclusion of proxies for market timing, capital market conditions, growth prospects, asymmetric information, and investor sentiment. Changes in liquidity are less relevant for issuance by firms with greater financial pressures, and by firms in less financially developed countries.

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1. Introduction

There is a large literature showing that aggregate stock market liquidity changes over time within countries (e.g., Chordia, Sarkar, and Subrahmanyam, 2005; Lesmond, 2005). Greater stock market liquidity means that it is easier to sell shares without affecting their price. We therefore expect that increases in stock market liquidity should be associated with increases in equity issuance. In this paper, we investigate this hypothesis using a sample of 37 countries from 1995 to 2014. We find strong support for the hypothesis that equity issuance increases following improvements in stock market liquidity.

As a firm's shares trade in a less liquid market, investors have to be given more of a discount to absorb these shares. We would therefore expect that equity issuance is more costly for existing shareholders when a firm's stock is less liquid because an increase in the supply of shares has a greater price impact. As issuance becomes more costly, firms are expected to issue less equity, everything else equal. The liquidity of a firm's common stock can worsen because aggregate liquidity worsens or because of idiosyncratic shocks. Idiosyncratic liquidity shocks could be caused by shocks to observed or unobserved firm attributes, so that it is difficult to identify the impact of liquidity as opposed to the impact of shocks to factors that affect liquidity as well as other firm characteristics. For instance, adverse information about a firm could increase information asymmetry which would lower liquidity. Since one would expect an increase in information asymmetry to make it more expensive for a firm to issue equity, identification of the liquidity effect on equity issuance when liquidity changes because of information asymmetry would be challenging. An additional complicating factor is that most individual firms issue equity rarely, so that tests at the firm level are unlikely to have much power.

In this paper, we resolve the identification issue in assessing the role of liquidity in the issuance decision by focusing on equity issuance at the country level and by examining the relation between changes in aggregate equity issuance and changes in aggregate liquidity. Aggregate liquidity could affect a firm's decision to issue equity because there are strong common factors in liquidity (e.g., Chordia, Roll, and Subrahmanyam, 2000) and because aggregate liquidity could proxy for the general capacity of the market to absorb new shares. An additional advantage of studying the relation between changes in equity issuance and changes in liquidity at the country level instead of the firm level is that reverse causation is far less of a concern since new issues tend to represent a small fraction of the overall market.

Like earlier papers that investigate equity issuance globally, such as Henderson, Jegadeesh, and Weisbach (2006) and Kim and Weisbach (2008), we obtain data on equity issues from SDC and include both initial public offerings (IPOs) and seasoned equity offerings (SEOs). Our dataset has 2,901 country-quarters. The measure of equity issuance we focus on is the number of equity issues (IPOs and/or SEOs) by country in a given quarter. We use the Amihud (2002) price impact proxy (estimated quarterly for each country based on daily stock level data) as our key liquidity measure. Since neither the number of issues nor aggregate liquidity is a stationary variable, we take first differences and run regressions of changes in equity issuance on changes in liquidity. We demean and standardize each of the country level variables by country, which enhances comparability across countries. Demeaning also takes care of country fixed effects, which may be important since recent studies (e.g., Doidge, Karolyi, and Stulz, 2013; Kim and Weisbach, 2008; McLean, Zhang, and Zhao, 2011) note that countries differ along many dimensions that affect equity issuance. All of our regressions use quarterly data and include time fixed effects.

When we regress changes in equity issuance on lead, contemporaneous, and lagged changes in liquidity, we find that while the coefficient on lead liquidity changes is not significant, contemporaneous liquidity changes as well as the first three lagged liquidity changes have a positive and significant coefficient. Based on the three lagged coefficients, a one standard deviation shock to liquidity is associated with an economically substantial 0.14 standard deviation cumulative shock to equity issuance over the subsequent three quarters. Since a large literature shows that liquidity and market returns are related (e.g., Amihud and Mendelson, 1986; Amihud, Hameed, Kang, and Zhang, 2015), our tests also include these variables side-by-side. Doing so is especially important because market returns are used to explain variation in equity issuance by many studies (e.g., Henderson, Jegadeesh, and Weisbach, 2006; Huang and Ritter, 2016) and are often interpreted as a proxy for market timing. We find positive and significant coefficients for contemporaneous as well as the first three lagged market returns. These coefficients indicate that a one standard deviation shock to returns is associated with a 0.13 standard deviation cumulative shock to issuance over the next three quarters. Not only is the relation between liquidity changes and changes in equity issuance economically and statistically significant when we allow for a relation between changes in equity issuance and stock returns, but the economic significance of the liquidity coefficients is thus as large as the economic significance of the coefficients on market returns.

After having established that changes in equity issuance are positively related to liquidity changes, we examine whether this relation can be explained by variables known to be correlated with aggregate liquidity that could affect equity issuance on their own. For example, U.S. studies predicting aggregate seasoned equity issuance (e.g., Choe, Masulis, and Nanda, 1993) and the aggregate rate at which firms go public (e.g., Lowry, 2003) show that equity issuance is affected by the state of capital markets and aggregate economic activity, which are variables known to be related to liquidity as well.

Our first battery of tests therefore controls for proxies for general capital market conditions, such as market volatility, turnover, and liquidity risk. It is already known from the literature that aggregate equity issuance is lower when market volatility is higher (e.g., Schill, 2004). While we find a negative contemporaneous coefficient of market volatility in our regressions, the coefficient is insignificant and its inclusion does not affect the sum of the coefficients on the liquidity variables. Similarly, market turnover is negatively related to equity issuance, but the inclusion of market turnover in the regression has no impact on the sum of the coefficients on liquidity. We find no evidence that equity issuance is related to lagged liquidity risk, but it is positively related to lead liquidity risk. Our evidence is thus consistent with firms timing liquidity risk, but adding liquidity risk has no impact on the coefficients on liquidity changes.

Since at least Amihud and Mendelson (1986), it is known that liquidity is related to valuation. Specifically, higher liquidity is associated with lower discount rates and higher valuations. It follows that one channel through which liquidity could affect issuance is the valuation channel. We want to establish that liquidity impacts issuance separately from the valuation channel. In other words, we want to show that there is a price pressure channel of the impact of liquidity. Our approach is to control for lead, contemporaneous, and lagged valuation measures. Our benchmark regressions already control for lead, contemporaneous, and lagged returns as proxies for market timing. Next, we additionally include a number of direct proxies for the level of market valuation. Market-to-book is used in studies of market timing (e.g., Loughran and Ritter, 1995, 1997; Baker and Wurgler, 2002; DeAngelo, DeAngelo, and Stulz, 2010). There is evidence that more liquid firms in the U.S. have a higher market-to-book ratio (Fang, Noe, and Tice, 2009). After controlling for liquidity and market returns, we find that the coefficients on contemporaneous and lagged market-to-book are not significant. However, the coefficient on the lead of market-to-book is positive and significant. Adding market-to-book to our regressions leaves our inferences are unchanged. The addition of other variables that capture market conditions also does not change our inferences about the impact of market liquidity.

Recent research shows that liquidity is a predictor of economic activity (e.g., Næs, Skjeltorp, and Ødegaard, 2011). Since at least Miller (1963), poor economic activity has been associated with lower equity issuance. We find that when we control for proxies for future levels of economic activity, the coefficients on the liquidity measures remain economically and statistically significant.

We then turn to tests that focus more directly on the nature of the mechanism that explains the relation between liquidity and equity issuance. For firms, an equity issuance has costs and benefits. Firms in good financial condition can more easily postpone an equity issue if they believe that it will be less costly in the future compared to firms that might be unable to pay their bills without new funding. Huang and Ritter (2016) find that immediate cash needs are "the primary predictor for net debt issuances and an important predictor for net equity issuances." They consider firms with low profitability and high leverage to be firms that do not have a choice but to issue equity. When we separate firms into those with positive return on assets (ROA) and those with negative ROA, we expect firms with negative ROA to be less affected by liquidity changes because they may have greater immediate cash needs and would find it much more difficult to issue debt. We find that this is the case.

We also explore whether the relation between changes in equity issuance and changes in liquidity differs across countries and across time. Countries differ in the ease with which firms can issue equity. We expect firms in more financially developed countries to be better able to react to changes in liquidity. We find that this is the case. An obvious concern is that our results could be driven by the financial crisis. When we remove the 2008-2011 period from our sample, a period that includes the peak of the European sovereign crisis as well as what is often referred to as the credit crisis, our results are similar.

Our paper contributes to several literatures. Our primary contribution is to the equity issuance literature. We find that liquidity is an important determinant of equity issuance across the world. Though much of the recent literature on equity issuance has focused on market timing motivations for equity issuance, we show that liquidity's economic significance as a determinant of equity issuance is of the same magnitude as the economic significance of variables that proxy for market timing. A growing recent literature emphasizes the interaction between market liquidity and funding liquidity, following the work of Brunnermeier and Pedersen (2009). The empirical literature on this interaction has focused on financial institutions. The results in this paper suggest that market liquidity affects funding liquidity more generally.

There is a large literature that builds on the findings in Harris and Gurel (1986) and Shleifer (1986) that a firm's stock price increases when it experiences an increase in demand because of being added to a stock index such as the S&P 500. Studies with access to data about demand curves for stocks find that demand curves are downward-sloping (e.g., Bagwell, 1992; Kandel, Sarig, and Wohl, 1999). If demand curves for stocks were perfectly elastic, we would not expect to find a relation between equity issuance changes and changes in liquidity. Braun and Larrain (2009) provide cross-country evidence on the impact of large issuances by showing that large IPOs in emerging markets have permanent adverse price impacts on correlated stocks. We contribute to this literature by presenting evidence indicating that downward-sloping demand curves may affect equity issuance.

Several papers investigate how stock liquidity affects some aspects of the equity issuance process. In particular, Butler, Grullon, and Weston (2005) show that underwriters charge more when liquidity is lower and Gao and Ritter (2010) demonstrate that underwriters affect the slope of the demand function for shares through their marketing activities. Our paper adds to that literature by showing that aggregate liquidity has a powerful relation with security issuance.

Finally, there is a large literature on the role of liquidity in the pricing of financial assets. In this paper, we provide evidence consistent with the view that the role of liquidity extends beyond the boundaries of financial markets and that it has a pervasive impact on corporate financial policies. While Fang, Noe, and Tice (2009) and Lipson and Mortal (2009) show that stock liquidity is related to a firm's capital structure, such a finding does not necessarily mean that firms are more likely to issue equity in more liquid markets. Our contribution therefore helps understand one mechanism whereby more liquid firms have less leverage, namely that higher liquidity makes it less costly to issue equity.

2. Data and methods

2.1 Issuance data

We obtain equity issuance data from the Securities Data Company (SDC). We select all public issues that take place between 1995 and 2014 in the 37 developed and developing countries in our sample.[1] We start our sample in 1995 because issuance data in SDC is sparse for a number of

[1] We do not include China in our sample, as the Chinese government placed a moratorium on issuance activity on several occasions. Interventions such as these might influence the relation between liquidity and issuance activity.

countries before 1995. We drop all issues in which non-common stock is issued and in which no primary shares are offered. We also exclude all issues from utilities and financial firms (SIC codes 49 and 6), as equity issuance by such firms may be affected by regulations. We only include the main tranche of each issue when there are multiple tranches, to avoid double counting and problems with issues distributed across multiple exchanges or countries.[2]

We remove foreign issues by comparing the country of domicile of the firm to the location of the exchange on which the shares are issued. If information on the location of the exchange is missing in SDC, it is supplemented with information on exchange location from Datastream. We discard tiny issues, defined as issues in which the number of shares issued is less than one percent of the number of shares outstanding after the issue.

For issues in the U.S., we distinguish between those that take place on the New York Stock Exchange (NYSE), Nasdaq, and other markets. We keep issues on the first two markets and treat them as separate "countries."[3] We discard the equity issues on the other U.S. markets. For issues in other countries, we eliminate all issues that did not take place on a main market. Issues taking place on non-main markets are often subject to different (lighter) sets of rules that are enforced by exchanges rather than by national regulators. Vismara, Paleari, and Ritter (2012) show that issues on such markets are sometimes closer to private placements than to public offerings, and that such issues tend to be smaller in size. By filtering out issues on non-main markets, we obtain a more homogeneous sample in terms of regulation and issue size.

To identify main markets, we proceed as follows. We first link the SDC market names to standardized market codes (Market Identifier Codes, or MICs) where possible; we discard SDC

[2] We do not exclude rights issues. Liquidity is expected to affect such issues as well. It would be interesting to separate out rights issues, but identifying rights issues in SDC is problematic (see internet Appendix for more details).

[3] Trading volume definitions differ across NYSE and Nasdaq for part of the sample period (Gao and Ritter, 2010); as trading volume is an input into our liquidity calculations, keeping these exchanges together would cause liquidity levels to change mechanically depending on the mix of stocks from both exchanges.

market names that cannot be linked to a MIC.[4] We then classify the remaining markets in our sample into main markets and non-main markets as follows. For markets in Europe, we follow the classification made by Vismara, Paleari, and Ritter (2012), who discuss the rise and fall of second markets in Europe in detail. For markets elsewhere, we classify markets based on information obtained from internet searches (e.g., exchange websites, news items). Finally, we use only the main markets that are part of the exchange with the largest issuance proceeds. In five of the countries in our sample, the main market is the result of a merger of separate markets that took place during our sample period. In these cases, we include issues on the merged market as well as on all "predecessor" markets, but we do a robustness check dropping these five countries from the sample. We refer to the Internet Appendix for a detailed discussion of our procedure to classify markets into main markets and non-main markets.

We aggregate the number of issues by country (and in the case of the U.S. per exchange) and by quarter based on the issue date, and use it as the main variable in our regressions. For each country, we set all quarters without issues in SDC before the first quarter with a positive number of issues to missing; we set all quarters without issues after the first quarter with a positive number of issues in SDC to zero, as we assume that SDC coverage has started as of that date.

2.2. Stock market data

We obtain daily data on prices, returns, volume, and shares outstanding for individual common stocks for the U.S. from CRSP, and for the other countries in our sample from Datastream, over the period from 1995 to 2014. We aim to be conservative in what securities we consider common stocks. For the data from CRSP, this is done by only including shares with share code 10 or 11. For the data from Datastream, we use the list of common stocks compiled by Hou and van Dijk (2017),

[4] We have contacted Thomson Reuters (the provider of the SDC data) on whether they could provide additional information on their market names; unfortunately, they could not provide any additional information useful for the identification of the markets behind the SDC market names.

which closely follows the data filters in Hou, Karolyi, and Kho (2011).

We restrict the sample by only including stocks that are traded on a main market, to be consistent with the equity issuance data and to avoid problems with differences in trading mechanisms and conventions, similar to Karolyi, Lee, and van Dijk (2012). Just like for equity issues, we split up U.S. stocks into those that trade on the NYSE and those that trade on Nasdaq. For Brazil and Germany, we only use data from 2000 onwards. For Brazil, there is a change in trading definitions in 1999. Daily trading volume data is not readily available for Germany before 2000 (Karolyi, Lee, and van Dijk, 2012). We refer to the Internet Appendix for a description of how we verify that the main markets identified in Datastream match those identified in SDC.

2.2.1. Stock level liquidity

We use the price impact measure developed by Amihud (2002) as our (il)liquidity measure. The Amihud measure is designed to capture the marginal impact of a unit of trading volume on the stock price. It is computed as the daily ratio of the absolute stock return over the local currency trading volume of the stock. This measure stays close to the intuitive description of liquid markets as those that accommodate trading with the least effect on price (e.g., Kyle, 1985).

Amihud (2002) shows that this measure is strongly positively related to microstructure estimates of illiquidity for the U.S. stock market. Lesmond (2005) reports a high correlation between the Amihud measure and bid-ask spreads in 23 emerging markets. Hasbrouck (2009) and Goyenko, Holden, and Trzcinka (2009) show that the Amihud measure performs well relative to other proxies in capturing high-frequency measures of liquidity based on U.S. data. Fong, Holden, and Trzcinka (2017) show that the Amihud measure is among the best monthly price impact proxies to capture high-frequency price impact measures based on global data. In contrast to high-frequency measures of liquidity, we can readily compute the Amihud measure using daily data for a large number of countries. Many recent empirical studies use the Amihud measure to assess stock market liquidity, both for the U.S. and for other countries (e.g., Acharya and Pedersen, 2005; Watanabe and Watanabe, 2008; Amihud, Hameed, Kang, and Zhang, 2015).

In constructing the Amihud measure, we stay close to the procedure described in Karolyi, Lee, and van Dijk (2012). We set all non-trading days, non-trading months, and outliers to missing. We consider a day to be a non-trading day if more than 90% of the stocks on a given exchange have a daily return equal to zero; we consider a month for a particular stock to be a non-trading month if zero-return days make up more than 80% of the total number of days in the month. We define a daily return for a particular stock as an outlier if it is in the top or bottom 0.1% of the cross-sectional distribution of daily returns on that day within the same country.

We calculate the Amihud measure per stock per day as:

$$Liq_{i,d} = -10{,}000 \times \ln(1 + \frac{|R_{i,d}|}{P_{i,d} \times VO_{i,d}}), \quad (1)$$

where $R_{i,d}$ is the return of stock *i* on day d, $P_{i,d}$ is the price, and $VO_{i,d}$ is the trading volume in number of shares. In Equation (1), we take natural logs of the standard Amihud proxy (absolute stock return divided by local currency trading volume) to reduce the impact of outliers, and we multiply the resulting measure by -10,000 to make it increasing in liquidity and to avoid very small values. The Amihud measure takes on values of negative infinity on days when there is no trading volume on a particular day for a particular stock (similarly, if both returns and trading volume are zero, a ratio of zeroes obtains); we set these values to missing. We average the liquidity over all trading days per month to obtain a monthly measure of liquidity for stock *i*.

2.2.2. Stock level returns

We calculate monthly returns per stock from Datastream's return index (RI) and CRSP's holding period returns (RET). We use the filter suggested by Ince and Porter (2006) and discard a monthly stock return if $(1 + R_{i,m})(1 + R_{i,m-1}) \leq 0.5$, where $R_{i,m}$ is the return of stock *i* in month *m* and where $R_{i,m}$ or $R_{i,m-1}$ is larger than 300%.

2.2.3. Stock level turnover

To measure turnover, we follow Karolyi, Lee, and van Dijk (2012). We calculate our turnover series as:

$$Turn_{i,d} = \ln\left(1 + \frac{UVO_{i,d}}{NOSH_{i,d}}\right) - \frac{1}{100}\sum_{k=1}^{100} \ln\left(1 + \frac{UVO_{i,d-k}}{NOSH_{i,d-k}}\right), \quad (2)$$

where $UVO_{i,d}$ is the unadjusted trading volume of stock *i* on day *d*, and $NOSH_{i,d}$ is the unadjusted number of shares outstanding. The second term on the right hand side of the equation is a moving average of past turnover; our turnover series is a deviation in turnover from this moving average. A similar approach is taken in other studies (e.g., Griffin, Nardari, and Stulz, 2007; Lo and Wang, 2000).

2.2.4 Additional filters on stock market data and aggregation to the country level

We set all monthly stock level liquidity, returns, and turnover values to missing if the stock has a monthly price at the end of the previous month in the top or bottom 1% of the cross-sectional distribution within a country, or if the stock has a monthly return, monthly liquidity, or monthly turnover in the current month in the top or bottom 1% of the cross-sectional distribution within a country.

To obtain country level series, we average the monthly stock level liquidity, returns, and turnover across all stocks within a country, weighting the stock level series with their market capitalization. Subsequently, we average the monthly country level variables across the months within a quarter to obtain quarterly country level variables. Finally, we winsorize the quarterly country level time-series of liquidity and turnover at the 1^{st} and 99^{th} percentile by country.

The country level Amihud liquidity proxy improves mechanically with increases in stock market capitalization. To remedy this, we follow Acharya and Pedersen (2005) and scale the liquidity series by country with the ratio of the market capitalization lagged by one quarter and the first available market capitalization for that country in the sample period:

$$Liq\_Scaled_{c,q} = Liq_{c,q} \times \frac{MV_{c,1}}{MV_{c,q}}, \quad (3)$$

where $Liq_{c,q}$ is the liquidity of country c in quarter q, $MV_{c,q}$ is the aggregate stock market capitalization of country c in quarter q, and quarter q=1 is the first quarter in the sample for country c.

2.3 Other variables

We obtain estimates of quarterly return volatility by country as the standard deviation of daily market returns within a quarter. We construct a quarterly time-series of liquidity risk by country as the conditional volatility of country level liquidity based on a GARCH(1,1) model estimated by country over the whole sample period. To obtain country level proxies for idiosyncratic volatility and stock price synchronicity, we follow Morck, Yeung, and Yu (2000) and first estimate a regression of daily individual stock returns on daily market returns per quarter for each individual stock. We require at least 15 non-missing observations per regression. From these regressions, we calculate the R^2 per stock per quarter, and the idiosyncratic volatility per stock per quarter. We take the average of these series, weighted by market capitalization, to obtain the average country level R^2 as well as country level idiosyncratic volatility. To obtain our measure of stock price synchronicity, we use the logistic transformation of the average country level R^2 to preclude that its values always fall within the interval [0,1]. We obtain data on the country level price-to-book value (PTBV), price-earnings ratio (PE), and dividend yield (DY) from Datastream. As proxies for macroeconomic conditions, we download data on GDP growth, sales growth, a leading economic indicator, and closed-end funds from the IMF, OECD, and Bloomberg. A detailed description of all variable definitions and data sources is included in the Appendix of this paper.

2.4. Unit roots, first differencing

For each country, the number of issues and the (scaled) liquidity variables are tested for stationarity using Augmented Dickey-Fuller (ADF) tests. For several countries, non-stationarity cannot be rejected for one or both variables. This may be due to the low power of the ADF tests to reject the null of non-stationarity or due to the variables being truly non-stationary in nature. To avoid any potential issues related to non-stationarity, we take the first difference of both the number of issues by country and of country level liquidity. After taking first differences of the number of issues and the liquidity variables, non-stationarity of both variables is rejected for all countries in the sample.

Due to differences in trading volume definitions and currency values, the means and standard deviations of the country level liquidity variable are not comparable across countries. To enhance comparability, we therefore demean and standardize each of the (changes in the) country level variables included in the regressions by country. A beneficial side effect of this transformation is that it facilitates the interpretation of the regression coefficients later on.

2.5. Summary statistics.

Table 1 provides summary statistics for our sample. We have 22 exchanges from developed countries, representing 21 countries. We have 16 emerging countries. In total, we have 37 countries and 38 markets. The number of issues per country varies greatly. Australia has the largest number of issues and Portugal has the smallest number. In total, we have 45,840 issues. More than three quarters of the issues are in developed countries. Of the total number of equity issues, 35,401 are SEOs and 10,439 are IPOs. The U.S. has the most IPOs. Table 1 shows the average and standard deviation of stock returns. All countries have positive arithmetic average returns over our sample period. The lowest standard deviation of returns is for New Zealand and the highest is for India. On average, emerging markets have a higher arithmetic average return and a higher standard deviation over our sample period.

The level of the Amihud liquidity measure is not comparable across countries because of differences in trading volume definitions and currency units. However, the standard deviation of the measure scaled by the absolute value of the mean gives a sense of the volatility of Amihud liquidity that is comparable across countries. Canada has the lowest (standardized) volatility of Amihud liquidity among developed countries. Amihud liquidity is considerably more volatile in emerging countries. Amihud liquidity volatility scaled by the absolute value of the mean averages 0.650 in developed countries and 1.066 in emerging countries.

3. Does liquidity help explain time-variation in equity issuance?

Table 2 shows the results of panel regressions of changes in equity issuance on changes in liquidity, market returns, and lagged issuance changes. The change in equity issuance is the quarterly change in the equity issuance count variable, i.e., the number of IPOs and SEOs. There is no need to include country fixed effects since all variables are demeaned. To be conservative, we include quarter fixed effects – analogous to one dummy for each year-quarter combination (as opposed to four quarterly dummies) – to account for any common global trends, although they subsume some of the time-variation in equity issuance that could potentially be due to liquidity changes, such as the drop in liquidity in the last quarter of 2008. An additional benefit of quarter fixed effects is that they account for potential seasonality, as prior studies (e.g., Lowry, 2003) argue that there may be institutional reasons that cause equity issuance to be less intense in the first calendar quarter. We report both the overall R^2 and the within R^2 that indicates the fraction of variation in the dependent variable after removing quarter fixed effects that can be explained by the independent variables. Standard errors are clustered by country and by quarter.

Model (1) of Table 2 includes the one-quarter lead change in market liquidity, the contemporaneous change, four quarterly lagged changes, the same leads and lags for market returns, and one lag of the change in the equity issuance count variable. We include market returns as it is well-accepted that equity issuance is related to market performance. We include lagged equity issuance changes because equity issuance can be partly explained by recent equity issuance. The coefficients on contemporaneous liquidity changes and the first three lags of liquidity changes are all positive and statistically significant. With the scaling we use, the one-quarter lagged liquidity coefficient of 0.07 indicates that a one standard deviation increase in liquidity in quarter *t*-1 is associated with an increase in equity issuance in quarter *t* corresponding to 7% of the standard deviation of equity issuance. A contemporaneous change in liquidity has a slightly bigger impact, at 0.10. The sum of all six liquidity coefficients is 0.23. The lead change in liquidity is not significant, so that firms do not appear to be able to time liquidity changes.

The coefficients on market returns are generally insignificant except for the contemporaneous coefficient which is 0.09 and the first lag which is 0.07. The sum of all six return coefficients in Model (1) is 0.24. Again, the lead coefficient is not significant, so that firms do not appear to be able to time aggregate market movements.[5]

We see that the first lag of the dependent variable is highly significant with a negative coefficient. The coefficient is -0.40, so that a one standard deviation increase in equity issuance implies a decrease of almost half that increase the next quarter, indicating strong mean reversion in equity issuance.

In Model (2), we use three lags of the dependent variable and find that all of them are significant. With three lags of the dependent variable, the contemporaneous change in market liquidity as well as the first three lags are again significant. If we add further lags of the dependent variable to Model (2) (not tabulated), the coefficients on the additional lags drop sharply and our inferences are unaffected.

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[5] McLean, Pontiff, and Watanabe (2009) argue that firms issue shares for two reasons – optimal capital structure and market timing – and that issuance for market timing motives is more likely when issuance costs are low. This argument would suggest that issuance is more likely to predict low stock returns in more liquid markets. In unreported analyses, we test this hypothesis by including interaction terms between lead market returns and contemporaneous and lagged market liquidity innovations and find that none of them has a significant coefficient.

We now consider the economic significance of the liquidity effects in more detail. The sum of the coefficients on the liquidity variables is a straightforward indication of the overall effect of variation in liquidity on variation in equity issuance that we use throughout the paper. In Model (2), the sum of all six liquidity coefficients is 0.31. Since the coefficients can be interpreted as the effect in standard deviations of the dependent variable when the independent variables are shocked by one standard deviation, the liquidity effects are economically sizable. An alternative way to assess economic significance is to trace the effect of a one-time, one standard deviation shock to liquidity on the evolution of equity issuance over subsequent quarters. To do so, we have to take into account the impact of the lags of the dependent variable because shocks to liquidity not only affect future equity issuance directly, but also indirectly through the lagged dependent variable. Taking these effects into account, the three significant liquidity coefficients at lags one through three in Model (2) indicate that a one standard deviation shock to liquidity is associated with an economically substantial 0.14 standard deviation cumulative shock to equity issuance over the subsequent three quarters.[6]

The three significant return coefficients in Model (2) indicate that a one standard deviation shock to returns is associated with a 0.13 standard deviation cumulative shock to issuance over the next three quarters, which is similar to the effect of a shock to liquidity. We note that the fact that the sum of the lagged dependent variables is more negative than -1 does not indicate that there is more than mean reversion in the number of issues. A one standard deviation increase in issuance is

[6] The economic significance of the three significant liquidity coefficients at lags one through three is computed as follows. In Model (2) of Table 2, the number of issues (*y*) is a function of liquidity (*x*) and lags of itself (the effect of market returns can be ignored for this computation): $y_t = \beta_1 x_{t-1} + \beta_2 x_{t-2} + \beta_3 x_{t-3} + \gamma_1 y_{t-1} + \gamma_2 y_{t-2} + \gamma_3 y_{t-3}$. If x_t is shocked by one standard deviation, keeping everything else equal (and noting that all variables are standardized to have unit standard deviation), then the effect on the change in the number of issues in subsequent quarters can be expressed as follows: $y_{t+1} = \beta_1$; $y_{t+2} = \beta_2 + \gamma_1\beta_1$; $y_{t+3} = \beta_3 + \gamma_1(\beta_2 + \gamma_1\beta_1) + \gamma_2\beta_1$. Substituting the coefficient estimates from Model (2) of Table 2 yields: $\widehat{y_{t+1}} = 0.08$; $\widehat{y_{t+2}} = 0.07 + 0.08 \times -0.56 = 0.0252$; $\widehat{y_{t+3}} = 0.08 - 0.56 \times (0.07 - 0.56 \times 0.08) - 0.37 \times 0.08 = 0.03628$. The cumulative effect of a one standard deviation shock to liquidity on equity issuance is the sum of these effects, which is equal to 0.1415. We note that, in this calculation, we only use the significant coefficients and only those of the lagged liquidity variables. We do not include the (significant) contemporaneous coefficient to avoid any potential concern about issuance affecting liquidity.

associated with a 0.56 decrease in issuance over the next quarter, a 0.056 decrease over the next two quarters, and a 0.01 increase over the next three quarters.[7] In other words, there is strong mean reversion in the dependent variable quarter-to-quarter, but, due to the interaction of the negative coefficients on the lagged dependent variable at different lags, the cumulative effect of a shock to the dependent variable actually almost dampens out two and three quarters ahead.

In Model (3), we add one additional lead change in market liquidity and two additional lagged changes. Doing so has no material impact on our inferences and the added variables do not have significant coefficients. When we remove the lead changes for market liquidity and market returns in Model (4), our inferences are also not affected. In Model (5), instead of using lags of market liquidity changes and market returns, we use the cumulative change in liquidity and the cumulative market return from quarter *t*-4 to *t*-1. We find that the coefficients on the cumulative change in market liquidity and on the cumulative market return are similar (0.20 versus 0.24) and that both coefficients are significant at the 1% level.

In all the regressions shown so far, we include both changes in market liquidity and stock returns. An obvious concern is that these variables are correlated, in that it is known from the literature that improvements in liquidity are associated with positive stock returns (e.g., Amihud and Mendelson, 1986, Chordia, Huh, and Subrahmanyam, 2009; Bali, Peng, Shen, and Tang, 2014). Model (6) shows estimates when we omit stock returns. We see that the coefficients on liquidity changes are mostly unaffected. When we omit changes in liquidity in Model (7), we find that the coefficients on returns are mostly unchanged as well. It follows that our inferences about the economic importance of liquidity changes relative to stock returns in explaining variation in equity issuance are not sensitive to the correlation between liquidity changes and returns. However, we

[7] The economic significance of the three significant return coefficients and of the three significant lagged issuance coefficients in Model (2) of Table 2 is computed in an analogous way to the economic significance of the liquidity coefficients as described in footnote 6.

note that both the within R^2 and the overall R^2 of Model (7) are slightly greater than those of Model (6).

4. Is the relation between liquidity and equity issuance due to other factors?

The results in the previous section show that equity issuance is positively related to liquidity, even after controlling for market returns. It is well-known that liquidity is related to financial market conditions as well as to macroeconomic conditions (e.g. Chordia, Roll, and Subrahmanyam, 2001; Chordia, Sarkar, and Subrahmanyam, 2005; Næs, Skjeltorp, and Ødegaard, 2011) and that financial market conditions and macroeconomic conditions are related to equity issuance (e.g., Lowry, 2003). Hence, it could be the case that our liquidity variables proxy for other factors that affect equity issuance and are correlated with liquidity. In this section, we investigate whether the effects of liquidity can be explained by other financial and economic variables, including capital market conditions, (expected) economic activity, asymmetric information, and investor sentiment.

4.1. Market conditions, liquidity, and equity issuance

We turn first to regressions that add variables that proxy for market conditions to our benchmark regression. The results are shown in Table 3, where Model (1) is our benchmark regression (Model (2) of Table 2) reproduced to make comparisons easier.

In Model (2) of Table 3, we add lead, contemporaneous, and lagged changes in market volatility to our benchmark model that includes market liquidity and returns. Our measure of market volatility is the standard deviation of daily market returns during that quarter. We know that liquidity is negatively related to volatility (e.g., Chordia, Sarkar, and Subrahmanyam, 2005), and Schill (2004) shows that there are fewer equity issues in volatile times using U.S. data. It is thus possible that the effects of liquidity in Table 2 capture the role of market volatility. Surprisingly, none of the changes in market volatility have a significant coefficient in our global dataset. Adding changes in market volatility to the regression has no material impact on our inferences about the relation between equity issuance and market liquidity from Table 2.

Baker and Stein (2004) argue that market liquidity is a sentiment indicator and that periods of positive sentiment coincide with intense equity issuance. Using turnover as a liquidity proxy, they show that liquidity is positively correlated with aggregate time-variation in U.S. equity issuance.[8] Model (3) of Table 3 shows that the relation between liquidity and equity issuance in our global sample is not driven by turnover since adding turnover changes has no material impact on the coefficient on market liquidity changes. It is interesting to note that, controlling for market liquidity changes, turnover changes have negative coefficients. The lead, contemporaneous, and two of the lagged coefficients are significant.

Model (4) shows that the contemporaneous relation between liquidity and equity issuance survives controlling for a proxy for liquidity risk (conditional liquidity volatility based on a GARCH(1,1) model estimated by country). Adding liquidity risk changes has no material impact on our estimates of the coefficients on liquidity changes.

Although we control for potential market timing effects using lead, contemporaneous, and lagged market returns, many studies use the market-to-book ratio as a proxy for market timing (e.g., DeAngelo, DeAngelo, and Stulz, 2010). Huang and Ritter (2016) use Tobin's q instead of market-to-book, but the two measures are typically highly correlated. Since more liquid firms in the U.S. have a higher market-to-book ratio (Fang, Noe, and Tice, 2009), we want to make sure that liquidity is not picking up the effect of market-to-book. We use a measure of the aggregate market-to-book ratio, which is obtained by summing up the market capitalization of all individual stocks in a

[8] Turnover can proxy for other stock characteristics besides liquidity. For instance, it can proxy for diversity of opinion. More generally, turnover does not seem to be widely accepted as a good proxy for time-series variation in liquidity. A common counterexample is that turnover tends to be high during financial crises, while liquidity tends to be low. Recent studies that evaluate liquidity proxies for U.S. and international equity markets (Goyenko, Holden, and Trzcinka, 2009; Fong, Holden, and Trzcinka, 2017) do not even include turnover as a proxy for liquidity. Lesmond (2005) studies the liquidity of emerging equity markets using different proxies (including turnover) and concludes: "These results cast doubt on a wide range of studies employing turnover as a principal liquidity proxy." (p. 423). In our sample, changes in market turnover are only weakly correlated with changes in market liquidity, at 0.06.

country and dividing by the sum of equity book values. Again, our inferences are not meaningfully affected by controlling for changes in the market-to-book ratio. The sum of the coefficients on market-to-book changes is 0.16, which is smaller than the sum of the coefficients for market liquidity of 0.30. (We note that coefficients can be directly compared across independent variables because they are standardized.) Perhaps not surprisingly, adding market-to-book has an adverse impact on the significance of the coefficients on market returns. Another measure of valuation that may be relevant for market timing is the price-earnings ratio. Again, adding that variable has no material impact on our results, as can be seen in Model (6). Lastly, we use the dividend-yield ratio. Not surprisingly, a higher dividend-yield ratio is negatively related to equity issuance changes. The lead, contemporaneous, and one-quarter lagged coefficients are significant. However, our inferences about the relation between equity issuance changes and liquidity changes are unaffected.

The last regression in Table 3, Model (8), uses all the variables introduced in Models (2) to (7). Obviously, these variables are correlated. It is noteworthy that adding all these variables to our benchmark model increases the within R^2 by only 2.4% relative to Model (1). When we add all these variables, the magnitude of the coefficients on lagged liquidity changes is little affected. The contemporaneous and first three lags of liquidity changes still have significant coefficients. It is noteworthy that in this specification the lead of market returns has a positive significant coefficient, but none of the other market return variables have significant coefficients.[9]

Though we do not reproduce the results in the table, we also estimate Model (2) of Table 2 adding proxies for the closed-end fund discount, which is used as a measure of sentiment (Lee, Shleifer, and Thaler, 1991). We construct the country closed-end fund discount variables in the same way as Karolyi, Lee, and van Dijk (2012). They construct time-series of local closed-end country fund discounts for 22 of the countries in our sample based on a sample of 42 closed-end

[9] Since many of the variables included in Table 3 are related, one might be concerned about potential multicollinearity issues. To investigate this concern, we compute variance inflation factors based on Model (8) of Table 3, and find that they do not indicate multicollinearity issues – possibly because all variables are included as changes rather than levels.

funds. Unfortunately, because of the limited availability of the closed-end fund discounts, our sample drops in half. Adding these variables has no impact on our inferences.

4.2. Macroeconomic conditions, liquidity, and equity issuance

It is well-known that expectations about macroeconomic conditions are related to equity issuance as well as to liquidity. In Table 4, we investigate the relation between changes in equity issuance and changes in market liquidity when we control for changes in various proxies for macroeconomic conditions. Admittedly, some of the variables used in Table 4 could fit equally well in Table 3. As with Table 3, we reproduce our benchmark regression Model (2) of Table 2 in the first column of the Table to make comparisons easier.

Recent studies show that liquidity forecasts economic activity (e.g., Næs, Skjeltorp, and Ødegaard, 2011) and we know from the equity issuance literature that firms issue more equity in anticipation of better economic conditions. Following Lowry (2003), we proxy for expectations about economic conditions using GDP growth in Model (2) and sales growth in Model (3) of Table 4. Lowry introduces these variables as proxies for the demand for capital. Adding the lead, contemporaneous, and four lags of GDP growth does not affect the coefficients on market liquidity materially and does not change our inferences. None of the coefficients on GDP growth are significant. Surprisingly, the coefficients are not only statistically insignificant, but they are economically small as well. In Model (3), we reach similar conclusions when we add sales growth. In Model (4), we include the composite leading economic indicator of the OECD (only available for OECD countries). None of the coefficients are significant. Adding the leading indicator has no material impact on our inferences.

It is well-documented that the liquidity of a stock is inversely related to the degree of asymmetric information about the stock's value. More asymmetric information is also likely to lead to greater costs of raising equity capital, so changes in information asymmetries could influence liquidity and equity issuance simultaneously and in the same direction. As argued in the introduction, this identification issue is unlikely to be of great concern in our analysis of the relation between aggregate liquidity and aggregate equity issuance.[10] Nonetheless, it may be the case that market-wide fluctuations in information asymmetries affect aggregate liquidity and aggregate issuance at the same time and in a similar way. In Model (5) of Table 4, we include a proxy for market-wide variation in information asymmetries, namely a measure of aggregate idiosyncratic volatility. The idiosyncratic volatility proxy is computed as the value-weighted average of the residual volatility from market model regressions run for each individual stock within a country. We find again that our inferences from Table 2 are unaffected when we add changes in idiosyncratic volatility. The only coefficient that is significant for idiosyncratic volatility changes is the coefficient for lag two, which is positive with a value of 0.07. In Model (6), we add "stock price synchronicity" changes as an alternative proxy for information asymmetries. Stock price synchronicity is computed as the value-weighted average R^2 from market model regressions run for each individual stock within a country. Morck, Yeung, and Yu (2000) argue that greater stock price synchronicity is associated with less-informative stock prices. Our inferences are not affected by the inclusion of stock price synchronicity.

In Model (7) of Table 4, we include all control variables from Models (2)-(6) simultaneously. Although we lose degrees of freedom due to a considerable reduction in the sample size because variables are missing for some country-quarters, the coefficients on contemporaneous and the first three lags of liquidity changes remain significant.

Overall, the results in Tables 3 and 4 suggest that the positive relation between market liquidity and aggregate equity issuance is unlikely to be due to economic or financial variables that are unrelated to the aggregate demand elasticity of the stock market, but could simultaneously affect liquidity and equity issuance for other reasons.

[10] Baker and Stein (2004, p. 272) state that it seems "a stretch to argue that there are large swings in the degree of asymmetric information about the market as a whole."

5. The determinants of the relation between equity issuance and liquidity change

In this section, we investigate the determinants of the relation between equity issuance changes and liquidity changes by exploring how the relation differs across countries, firm and issue types, time, and type of liquidity shocks. We also investigate whether there is a relation between changes in equity issuance proceeds (as opposed to counts) and liquidity changes.

Firms may have to issue equity with different degrees of urgency. In particular, DeAngelo, DeAngelo, and Stulz (2010) show that many firms that issue equity would have a cash flow deficit without the equity issue. Huang and Ritter (2016) show more generally that firms that are likely to run out of funds issue securities. They take the view that, among firms that are likely to run out of funds, firms with low profitability and high leverage are firms that have no choice but to issue equity. We expect that if a firm has to issue equity with a great degree of urgency, variation in liquidity will not have much impact on its decision. To investigate this hypothesis, we split issuing firms into issuers that have positive return on assets in the year of the issue (ROA, obtained from Datastream) versus issuers that have negative return on assets. Firms with negative ROA are unlikely to postpone issuing equity because the market has become less liquid as they may require new funds simply to stay afloat. We show the results in Panel A of Table 5. As before, Model (1) reproduces our benchmark model for comparison. Model (2) shows the regression estimates for the sub-sample of issuers with positive ROA. The coefficients on contemporaneous liquidity changes as well as the first three lags of liquidity changes are positive and significant. The sum of the coefficients on liquidity changes is 0.27. When we turn to the coefficients on market returns, the contemporaneous market return and the first lag are significant. The sum of the coefficients is 0.27. It follows that for these firms there is a strong relation between equity issuance changes and liquidity changes. When we turn to firms with negative ROA in Model (3), only the coefficients on contemporaneous and lag three of market liquidity changes are (marginally) significant. The sum of the coefficients is 0.16. Essentially, there is a much weaker relation between equity issuance changes and market liquidity changes for these firms. The coefficients on market returns are also smaller, but the lead, contemporaneous, and first lag of market returns have a significant coefficient. None of the coefficients exceeds 0.06.

We next investigate how the issuance/liquidity relation is affected by a country's financial development. There are good reasons to think that the equity issuance decision is different in financially developed countries versus other countries. In more financially developed countries, we expect firms to be better able to issue equity rapidly and take advantages of changes in circumstances. In such countries, the stock market is more established and deeper. There is a vast literature showing that firms in less financially developed countries often find it advantageous to issue equity outside their country, taking advantage of better developed stock markets (e.g., Henderson, Jegadeesh, and Weisbach, 2006). Our measure of financial development is the average of the annual ratio of aggregate stock market capitalization to GDP over our sample period (obtained from the World Bank) and we define financially developed countries as the ones in the top half of the sample based on this measure.

Model (4) in Panel A of Table 5 estimates the benchmark model for financially developed countries. The market liquidity change variables have significant positive coefficients contemporaneously and at lags one through three. The sum of the coefficients of 0.46 is almost 50% higher than that of the benchmark model. The sum of the coefficients on the stock return variables is only slightly larger than in the benchmark model, at 0.44. Hence, the economic importance of the coefficients on liquidity changes is substantial for financially developed countries, and about the same as the economic importance of the coefficients on stock returns. Turning to the less financially developed (or financially emerging) countries in Model (5), we see that no coefficient on liquidity changes is significant except for the second and third lag. The sum of the coefficients on liquidity changes is 0.15. The sum of the coefficients on stock returns is slightly smaller than in the benchmark regression, so we find that for less financially developed countries, there appears to be a much weaker relation between equity issuance changes and liquidity while there is a slightly weaker relation between equity issuance and stock returns. In unreported tests, we estimate Models (2)-(5) of Table 5 with additional variables, including leading economic indicators, turnover, changes in the price-earnings ratio, and changes in idiosyncratic volatility, and our conclusions are unchanged.

We consider next whether the impact of changes in liquidity on equity issuance is different during the financial crisis. We examine how our results depend on the crisis by identifying a crisis period from 2008 to 2011. This period is chosen to include the credit crisis and the European sovereign debt crisis. If we estimate the benchmark regression excluding the crisis period, the sum of the liquidity coefficients is 0.29. These estimates are shown in Model (6). We estimate the same model for the crisis period. The results are shown in Model (7). We find that the coefficients on the contemporaneous, and lags two and three of the liquidity coefficients are significant and the sum of the coefficients is 0.35. It follows that changes in liquidity during the crisis period have a similar effect as those outside of the crisis.

The regressions shown so far are based on the number of initial public offerings (IPOs) and seasoned equity issuances (SEOs) combined. An obvious question is whether our inferences hold separately for IPOs and SEOs. We show results in Panel B of Table 5. As before, the first regression in Panel B reproduces our benchmark regression. Model (2) estimates our benchmark regression for SEOs only. We find that lags one, two and three as well as contemporaneous liquidity changes are significant. When we exclude the crisis period from the SEO sample in Model (3), we find that lead liquidity changes are also significant. This finding could be consistent with the idea that since it tends to be possible to execute SEOs at relatively short notice, firms may be able to time their SEOs ahead of decreasing market liquidity. Models (4) and (5) show that, with and without the crisis period, for IPOs, only the coefficients on the first three lags of liquidity changes are significant. The fact that contemporaneous and lead liquidity changes do not significantly affect IPOs fits with the idea that it is more costly to time IPOs than SEOs to take advantage of changes in liquidity. Overall, we conclude that the effect of liquidity on issuance obtains for both SEOs and IPOs.

Our last investigation in Panel B of Table 5 looks at the relation between the aggregate proceeds from equity issues (instead of the number of issues) and liquidity. In most countries, proceeds are noisy since an issue by a large firm can make a big difference in the total amount of proceeds. In contrast, whether a large firm issues instead of a small firm has no impact on the number of issues. Model (6) shows that when we include the crisis period there is no relation between changes in aggregate proceeds and changes in market liquidity. When we exclude the crisis period in Model (7), only the third lag of liquidity changes has a positive and significant coefficient. The lead of liquidity changes has a negative and significant coefficient, which is consistent with market timing.

6. Robustness

As a first additional check of the robustness of our main results, we investigate whether taking into account the effects of liquidity changes allows for better out-of-sample predictions of changes in equity issuance by performing a one-step-ahead forecasting exercise. While relevant in itself, this exercise also shows whether the liquidity effects found in the analyses so far are stable as opposed to sample-specific. To this end, we divide the sample period into an in-sample part and an out-of-sample part. We first estimate coefficients in-sample using a panel regression with quarter fixed effects, and subsequently use the estimated coefficients to make a one-quarter-ahead out-of-sample forecast of changes in equity issuance. We then compare the forecasts to the actual values in the out-of-sample part, expand the in-sample estimation window by one quarter and repeat the exercise. We continue until we reach the end of the sample period.

Panels A, B, and C of Table 6 show the mean-squared prediction errors (MSPEs), for in-sample starting periods of, respectively, the first 30%, 50%, and 70% of the sample period. Each panel contains two pairs of models. Model (1) is a benchmark model that represents a naive forecast: the forecast of next quarter's equity issuance changes equals the average change in equity issuance over the in-sample estimation window. In contrast, in Model (2), the forecast of next quarter's change in equity issuance is a function of the three significant lags of liquidity changes from Model

(2) of Table 2. In Panels A, B and C, the MSPE is lower in Model (2) than in Model (1), both when the crisis period is included in the sample and when it is not. Diebold-Mariano (1995) tests show that these decreases in prediction errors are significant. In other words, using liquidity changes to predict next quarter's equity issuance changes significantly improves forecasting performance relative to the naive forecast.

Model (3) is again a benchmark and contains three lags of changes in the number of issues as well as three lags of market returns. Model (4) adds three lags of changes in market liquidity to Model (3). In Panel A, the MSPE of Model (4) is slightly lower than the MSPE in Model (3) when the crisis is included in the sample, though the difference is not statistically significant. However, when the crisis is excluded, the MSPE of Model (4) is lower, and significantly so, indicating that including liquidity variables in the forecasting model significantly improves forecasting performance. In Panel B, the MSPE of Model (4) is slightly lower than the MSPE in Model (3) regardless of whether the crisis is included. However, neither of the differences are significant. In Panel C, the MSPE of Model (4) is marginally lower than the MSPE in Model (3) when the crisis is included in the sample, though not significantly so. However, when the crisis is excluded, the MSPE of Model (4) is significantly lower, again indicating that adding the liquidity variables improves forecasting performance.

Overall, these results suggest that including liquidity changes in the prediction model improves out-of-sample prediction of changes in equity issuance. The extent to which it improves performance depends on the in-sample size, and on whether the crisis period is included in the analysis. Including liquidity changes never significantly deteriorates forecasting performance. We conclude that the liquidity effects uncovered in this paper are stable rather than sample-specific and that liquidity may be useful in predicting issuance activity.

In addition to the various robustness checks of our regressions we report throughout the paper, we implement a battery of further robustness checks. We report the results in Table 7. Model (1) of Table 7 reproduces our benchmark regression for comparison.

As we discussed, the variables in our regressions are first differenced and demeaned. In Model (2), we do not demean the variables. The results are almost identical. Further, throughout the paper, we estimate our regressions using quarter fixed effects. These effects effectively remove common effects across countries. We remove them to be conservative as these effects could be business cycle effects, for instance. However, these effects could also in part represent common liquidity shocks, so that by removing them we only have country-specific liquidity shocks. Model (3) estimates our benchmark regression without the quarter fixed effects (we therefore include an intercept but do not report its estimate in the table). We see that the sum of the liquidity coefficients is now 0.31, the same as in Model (1). Since removing the quarter fixed effects has little impact on the coefficients, a conclusion to be drawn from the comparison of Model (3) to the benchmark model is that country-specific liquidity shocks appear to be more important than common liquidity shocks across countries. It is noteworthy that removing the quarter fixed effects has more of an impact on the market return coefficients. In Model (3), the sum of the coefficients on market returns is 0.29, which is substantially lower than the sum of 0.38 in Model (1). Further, only two coefficients on market returns are significant in Model (3) in contrast to four in Model (1).

As we discussed earlier, exchanges merge. When exchanges in the countries in our sample merge during our sample period, we include in our dataset issuances from the exchanges that form the merged exchange. This choice could raise issues in that before the merger we are using a liquidity measure that is based on stocks trading on different markets that may have different trading volume definitions, potentially hampering the comparability of the Amihud liquidity measure across these markets. To examine the relevance of this concern, we eliminate the countries in which the main market was the result of a merger that took place during our sample period. As shown in Model (4), if anything, doing so strengthens our results.

We collect data from 1990 but do not use it because for some countries it is not clear that SDC collected data systematically before 1995. Nevertheless, if we use the longer sample period 1990-2014, Model (5) shows that our results hold up.

To address the issue that our results could be overly influenced by specific countries that have a large number of (tiny) equity issues (such as Australia, Canada, India, and Japan), we investigate whether removing these countries from the sample affects our results. It does not. In Model (6), we show that removing Australia, Canada, India, and Japan from the sample hardly affects the regression coefficients.

7. Conclusions

In this paper, we show that equity issuance across the world is strongly related to equity market liquidity. Using changes in country level liquidity as an explanatory variable for changes in equity issuance, we find that variation in equity issuance is significantly related to contemporaneous and past liquidity variation. We provide evidence that this relation between liquidity changes and equity issuance changes cannot be attributed to liquidity serving as a proxy for the general state of capital markets, aggregate economic activity, asymmetric information or market sentiment. It is also not plausible that the relation could be due to reverse-causation, since equity issuance typically represents a small fraction of existing stock outstanding at the country level. We show that issuance is more strongly related to liquidity in more financially developed markets, consistent with the view that firms are able to issue equity more rapidly in these countries. In contrast, the relation between issuance and liquidity is weaker for loss making firms, which suggests that in circumstances where issuing equity is a matter of greater urgency, liquidity considerations play a smaller role. Furthermore, we show that accounting for variation in liquidity not only improves explanatory power for issuance variation in-sample, but also enhances out-of-sample predictive power.

The economic magnitude of the relation between equity issuance changes and liquidity changes is similar to that of the relation between equity issuance changes and market returns. A one standard deviation shock to liquidity is associated with a 0.14 standard deviation cumulative shock to equity issuance over the subsequent three quarters, while a one standard deviation shock to returns is associated with a 0.13 standard deviation shock to equity issuance over the subsequent three quarters. For more financially developed markets, the economic significance of the liquidity effects is again similar to that of returns, and substantially greater than for less financially developed countries.

Overall, we interpret our findings to be supportive of the view that asset market liquidity affects the cost of equity issuance and that firms take asset market liquidity into account when deciding whether and when to issue equity.

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Appendix: Variable definitions and data sources

Variable	Description	Source
Dependent variables		
number of issues	The quarterly number of primary common share issues (Initial Public Offerings (IPOs) and Seasoned Equity Offerings (SEOs)) on main markets. The Internet Appendix discusses the classification of main markets. Aggregation by quarter is based on the issue date. We exclude issues by utilities and financial firms, foreign issues, very small issues, and issues that were eventually postponed or cancelled. For the U.S., we include issues by firms on both Nasdaq and NYSE, but treat these markets as separate countries.	Securities Data Company (SDC)
number of IPOs	The quarterly number of primary common share issues (IPOs only) on main markets. Aggregation by quarter is based on the issue date. We exclude issues by utilities and financial firms, foreign issues, very small issues, and issues that were eventually postponed or cancelled. For the U.S., we include issues by firms on both Nasdaq and NYSE, but treat these markets as separate countries.	Securities Data Company (SDC)
number of SEOs	The quarterly number of primary common share issues (SEOs only) on main markets. Aggregation by quarter is based on the issue date. We exclude issues by utilities and financial firms, foreign issues, very small issues, and issues that were eventually postponed or cancelled. For the U.S., we include issues by firms on both Nasdaq and NYSE, but treat these markets as separate countries.	Securities Data Company (SDC)
number of issues: ROA>0	The quarterly number of primary common share issues (IPOs and SEOs) on main markets by firms that had a positive ROA in the year before the offering. Aggregation by quarter is based on the issue date. We exclude issues by utilities and financial firms, foreign issues, very small issues, and issues that were eventually postponed or cancelled. For the U.S., we include issues by firms on both Nasdaq and NYSE, but treat these markets as separate countries.	Own computations; Securities Data Company (SDC)
number of issues: ROA<0	The quarterly number of primary common share issues (IPOs and SEOs) on main markets by firms that had a positive negative ROA in the year before the offering. Aggregation by quarter is based on the issue date. We exclude issues by utilities and financial firms, foreign issues, very small issues, and issues that were eventually postponed or cancelled. For the U.S., we include issues by firms on both Nasdaq and NYSE, but treat these markets as separate countries.	Own computations; Securities Data Company (SDC)
proceeds	The quarterly proceeds of issues (IPOs and SEOs) on main markets. Aggregation by quarter is based on the issue date. We exclude issues by utilities and financial firms, foreign issues, very small issues, and issues that were eventually postponed or cancelled. For the U.S., we include issues by firms on both Nasdaq and NYSE, but treat these markets as separate countries.	Securities Data Company (SDC)

Appendix, continued

Variable	Description	Source
Independent variables		
market returns	The quarterly average of monthly local currency stock level market returns aggregated to the market level using value weighting.	Own computations; CRSP, Datastream
market liquidity	The quarterly average of monthly stock level liquidity aggregated to the market level using value weighting, scaled by the reciprocal of the growth in aggregate market capitalization since the beginning of the sample period for that market. The monthly stock level liquidity is calculated as the average daily liquidity within the month. Daily stock level liquidity is calculated as Amihud's (2002) price impact proxy for individual stocks – computed as the absolute stock return divided by local currency trading volume. The Amihud measure is multiplied by -10,000 to obtain a measure that is increasing in liquidity.	Own computations; CRSP, Datastream
market volatility	The standard deviation of daily market returns within a quarter.	Own computations; CRSP, Datastream
market turnover	The quarterly average of monthly country level turnover. Daily stock level turnover is calculated as the deviation in the ratio of trading volume and the number of shares outstanding from its long-term moving average. Monthly country level turnover is calculated as the value weighted average of the average monthly stock level turnover.	Own computations; CRSP, Datastream
market liquidity risk	The conditional volatility of quarterly market-wide Amihud liquidity based on a GARCH(1,1) model estimated by country.	Own computations; CRSP, Datastream
market-to-book ratio	The aggregate market value of equity, scaled by the aggregate book value of equity of all listed common stocks within a country.	Own computations; Datastream
price-earnings ratio	The aggregate market value of equity, scaled by the aggregate earnings of all listed common stocks within a country.	Own computations; Datastream
dividend-yield	Aggregate dividends, scaled by the aggregate market value of equity of all listed common stocks within a country.	Own computations; Datastream
GDP growth	Year-on-year % change of quarterly GDP (real, seasonally adjusted) by country.	IMF; World Bank
sales growth	Year-on-year % change of quarterly aggregate sales by country.	IMF; World Bank
leading economic indicator growth	The quarterly amplitude-adjusted composite leading economic indicator by country.	OECD Statistics
idiosyncratic volatility	The quarterly value-weighted average across all stocks within a country of the standard deviation of the residuals obtained from a simple market model run based on daily data within the quarter.	Own computations; Datastream
stock price synchronicity	The logistic transformation of the quarterly value-weighted average R^2 across all stocks within a country from a simple market model run based on daily data within the quarter.	Own computations; Datastream

Table 1: Summary statistics

This table reports the total number of equity issues (IPOs and SEOs from SDC), the number of IPOs, the number of SEOs, the time-series arithmetic average and standard deviation (by quarter) of daily local stock market returns (expressed in % per day), the standard deviation of local market liquidity scaled by the absolute value of the time-series average, and the time-series average of local market volatility for each of the 38 markets (37 countries; Nasdaq and NYSE are included separately) in our sample. The sample covers the period 1995Q1-2014Q4 (with the exception of Brazil and Germany, for which the data start in 2000Q1; Egypt, for which the data start in 1996Q4, and Russia, for which the data start in 2000Q1). Market returns are value-weighted average returns of common stocks from CRSP for the U.S., and from Datastream for the other countries. Market liquidity is the value-weighted average across stocks of the average daily estimates by month of Amihud's (2002) price impact proxy for individual stocks – computed as the absolute stock return divided by local currency trading volume (and multiplied by -10,000 to obtain a measure that is increasing in liquidity, and scaled by the reciprocal of the growth in aggregate market capitalization since the beginning of the sample period for that market). Market volatility is the standard deviation of daily market returns within a quarter. The table also depicts the total number of equity issues and the average of the other variables for developed countries and for emerging countries, as well as the grand total / average for developed and emerging countries jointly.

	# equity issues	*# IPOs*	*#SEOs*	*market returns (% per day)*		*market liquidity*	*market volatility*
				mean	st.dev.	st.dev. /|mean|	mean
Developed countries							
Australia	17,558	1,516	16,042	0.061	0.114	0.537	0.018
Austria	72	28	44	0.053	0.190	0.425	0.011
Belgium	155	62	93	0.050	0.180	0.680	0.011
Canada	2,233	282	1,951	0.072	0.123	0.357	0.009
Denmark	178	54	124	0.068	0.165	0.891	0.020
Finland	163	53	110	0.077	0.212	0.481	0.013
France	700	325	375	0.062	0.159	0.425	0.011
Germany	737	301	436	0.033	0.176	0.386	0.012
Hong Kong	1,999	450	1,549	0.071	0.203	0.773	0.014
Israel	108	23	85	0.073	0.176	0.564	0.011
Italy	238	123	115	0.057	0.179	1.890	0.014
Japan	1,773	389	1,384	0.039	0.161	0.515	0.012
New Zealand	222	49	173	0.051	0.111	0.382	0.008
Norway	445	106	339	0.073	0.176	0.844	0.012
Singapore	900	281	619	0.052	0.177	0.709	0.011
Spain	127	28	99	0.052	0.161	0.621	0.012
Sweden	420	65	355	0.073	0.165	0.698	0.013
Switzerland	137	42	95	0.052	0.136	0.491	0.010
The Netherlands	188	42	146	0.060	0.187	0.856	0.013
United Kingdom	1,754	379	1,375	0.057	0.114	0.639	0.010
United States: Nasdaq	6,346	2,685	3,661	0.096	0.185	0.621	0.014
United States: NYSE	2,068	613	1,455	0.065	0.113	0.523	0.010
Total/average	38,521	7,896	30,625	0.061	0.162	0.650	0.012

Table 1, continued

	# equity issues	*# IPOs*	*#SEOs*	*market returns*		*market liquidity*	*market volatility*
				mean	st.dev.	st.dev. /|mean|	mean
Emerging countries							
Brazil	251	71	180	0.126	0.200	2.368	0.014
Chile	194	20	174	0.060	0.153	1.304	0.008
Colombia	52	3	49	0.104	0.294	0.631	0.012
Egypt	159	18	141	0.071	0.270	0.952	0.014
Greece	162	103	59	0.035	0.307	0.991	0.018
India	2,303	1,040	1,263	0.095	0.310	0.599	0.012
Indonesia	331	197	134	0.138	0.297	1.927	0.016
Malaysia	1,120	427	693	0.053	0.216	0.811	0.010
Mexico	71	20	51	0.088	0.152	0.929	0.012
Philippines	204	57	147	0.075	0.206	1.169	0.012
Poland	300	164	136	0.072	0.218	1.039	0.014
Portugal	39	7	32	0.038	0.200	0.700	0.011
Russia	209	17	192	0.082	0.300	1.707	0.020
South Africa	154	24	130	0.082	0.136	0.548	0.010
South Korea	1,182	170	1,012	0.070	0.268	0.504	0.016
Thailand	588	205	383	0.064	0.252	0.880	0.014
Total/average	7,319	2,543	4,776	0.078	0.236	1.066	0.013
Developed and emerging countries							
Grand total/average	45,840	10,439	35,401	0.068	0.193	0.825	0.013

Table 2: Panel regressions of changes in equity issuance on changes in market liquidity and market returns

This table reports coefficient estimates of panel regressions using quarterly data from 38 countries (NYSE and Nasdaq counted separately) over the period 1995Q1-2014Q4. The dependent variable is the change in the number of equity issues (common stock IPOs and SEOs from SDC). Independent variables include lead, contemporaneous, and lagged changes in local market liquidity, local market returns, and lagged dependent variables. Variable definitions are in the Appendix. All variables are demeaned and standardized by country, so any coefficient can be interpreted as the effect in standard deviations on the dependent variable of a one standard deviation shock to the independent variable corresponding to that coefficient. Standard errors are clustered by country and quarter. Significance at the 1%, 5% and 10% level is indicated by ***, **, and *.

Dependent variable:				***Δ number of issues (t)***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ market liquidity (t+2)			0.00				
Δ market liquidity (t+1)	-0.01	-0.02	-0.02			-0.03	
Δ market liquidity (t)	0.10***	0.08***	0.08***	0.09***		0.09***	
Δ market liquidity (t-1)	0.07***	0.08**	0.08**	0.08**		0.08***	
Δ market liquidity (t-2)	0.03*	0.07***	0.07***	0.06***		0.07***	
Δ market liquidity (t-3)	0.04***	0.08***	0.08***	0.07***		0.08***	
Δ market liquidity (t-4)	0.00	0.02	0.02			0.02	
Δ market liquidity (t-5)			0.01				
Δ market liquidity (t-6)			0.00				
Δ market liquidity (t-4:t-1)					0.20***		
market returns (t+1)	0.01	0.01	0.00				0.00
market returns (t)	0.09***	0.11***	0.11***	0.11***			0.12***
market returns (t-1)	0.07***	0.10***	0.10***	0.10***			0.11***
market returns (t-2)	0.02	0.05*	0.05	0.06**			0.05
market returns (t-3)	0.03	0.07***	0.07***	0.07***			0.06***
market returns (t-4)	0.02	0.04	0.04				0.02
market returns (t-4:t-1)					0.24***		
Δ number of issues (t-1)	-0.40***	-0.56***	-0.56***	-0.56***	-0.55***	-0.55***	-0.55***
Δ number of issues (t-2)		-0.37***	-0.36***	-0.37***	-0.36***	-0.35***	-0.37***
Δ number of issues (t-3)		-0.23***	-0.24***	-0.23***	-0.23***	-0.22***	-0.24***
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes
$N_{observations}$	2,837	2,831	2,787	2,864	2,880	2,831	2,853
$N_{countries}$	38	38	38	38	38	38	38
R^2_{within} (%)	17.4	26.9	26.7	26.7	24.8	25.4	25.8
R^2 (%)	28.8	37.0	37.0	36.7	35.1	35.7	35.9

Table 3: Panel regressions of changes in equity issuance on changes in market liquidity: Controlling for market conditions

This table reports coefficient estimates of panel regressions using quarterly data from 38 countries (NYSE and Nasdaq counted separately) over the period 1995Q1-2014Q4. The dependent variable is the change in the number of equity issues (common stock IPOs and SEOs from SDC). Independent variables include lead, contemporaneous, and lagged changes in local market liquidity, local market returns, changes in local market volatility, changes in local market turnover, changes in local market liquidity risk, changes in the local market-to-book ratio, changes in the local price-earnings ratio, changes in the local dividend-price ratio, changes in the local dividend yield, and lagged dependent variables. Variable definitions are in the Appendix. In Model (1) of this table, we reproduce the benchmark regression Model (2) of Table 2. All variables are demeaned and standardized by country, so any coefficient can be interpreted as the effect in standard deviations on the dependent variable of a one standard deviation shock to the independent variable corresponding to that coefficient. Standard errors are clustered by country and quarter. Significance at the 1%, 5% and 10% level is indicated by ***, **, and *.

Table 3, continued

Dependent variable:	*Δ number of issues (t)*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ market liquidity (t+1)	-0.02	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01
Δ market liquidity (t)	0.08***	0.08***	0.08***	0.09***	0.08***	0.08***	0.07***	0.08***
Δ market liquidity (t-1)	0.08**	0.08**	0.08**	0.09***	0.08**	0.08**	0.07**	0.07**
Δ market liquidity (t-2)	0.07***	0.08***	0.07***	0.07***	0.07***	0.07***	0.06***	0.06***
Δ market liquidity (t-3)	0.08***	0.08***	0.07***	0.07***	0.07***	0.06***	0.06***	0.05***
Δ market liquidity (t-4)	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01
market returns (t+1)	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.04*
market returns (t)	0.11***	0.11***	0.11***	0.11***	0.07***	0.11***	0.07**	0.04
market returns (t-1)	0.10***	0.09***	0.08***	0.10***	0.07***	0.08***	0.05*	0.02
market returns (t-2)	0.05*	0.06**	0.05*	0.06*	0.03	0.03	0.03	0.01
market returns (t-3)	0.07***	0.08***	0.06***	0.08***	0.05	0.05*	0.06*	0.04
market returns (t-4)	0.04	0.04	0.03	0.04	0.04	0.04	0.05	0.04
Δ market volatility (t+1)		0.05						0.07**
Δ market volatility (t)		-0.02						-0.01
Δ market volatility (t-1)		0.01						-0.02
Δ market volatility (t-2)		0.04						0.02
Δ market volatility (t-3)		0.05						0.02
Δ market volatility (t-4)		0.03						0.01
Δ market turnover (t+1)			-0.08***					-0.10***
Δ market turnover (t)			-0.15***					-0.16***
Δ market turnover (t-1)			-0.10**					-0.08*
Δ market turnover (t-2)			-0.09*					-0.06
Δ market turnover (t-3)			-0.04					-0.02
Δ market turnover (t-4)			0.00					0.02
Δ market liquidity risk (t+1)				0.06**				0.06**
Δ market liquidity risk (t)				0.01				0.01
Δ market liquidity risk (t-1)				-0.01				-0.01
Δ market liquidity risk (t-2)				0.01				0.00
Δ market liquidity risk (t-3)				0.01				0.00
Δ market liquidity risk (t-4)				0.01				0.01
Δ market-to-book ratio (t+1)					0.05**			0.05**
Δ market-to-book ratio (t)					0.04			0.01
Δ market-to-book ratio (t-1)					0.02			0.01
Δ market-to-book ratio (t-2)					0.04			0.03
Δ market-to-book ratio (t-3)					0.01			0.00
Δ market-to-book ratio (t-4)					0.00			0.01
Δ price-earnings ratio (t+1)						0.01		-0.01
Δ price-earnings ratio (t)						0.04**		0.03
Δ price-earnings ratio (t-1)						0.05*		0.03
Δ price-earnings ratio (t-2)						0.05***		0.04*
Δ price-earnings ratio (t-3)						0.01		0.00
Δ price-earnings ratio (t-4)						0.01		0.01
Δ dividend-yield (t+1)							-0.08***	-0.07***
Δ dividend-yield (t)							-0.09***	-0.07***
Δ dividend-yield (t-1)							-0.06***	-0.05*
Δ dividend-yield (t-2)							-0.04	-0.03
Δ dividend-yield (t-3)							0.00	-0.01
Δ dividend-yield (t-4)							0.01	0.01
Δ number of issues (t-1)	-0.56***	-0.56***	-0.57***	-0.56***	-0.57***	-0.57***	-0.57***	-0.58***
Δ number of issues (t-2)	-0.37***	-0.37***	-0.38***	-0.37***	-0.39***	-0.38***	-0.39***	-0.39***
Δ number of issues (t-3)	-0.23***	-0.23***	-0.23***	-0.24***	-0.24***	-0.24***	-0.24***	-0.24***
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
$N_{observations}$	2,831	2,831	2,831	2,825	2,671	2,673	2,673	2,666
$N_{countries}$	38	38	38	38	36	36	36	36
R^2_{within} (%)	26.9	27.2	27.5	27.0	27.6	27.7	28.0	29.3
R^2 (%)	37.0	37.3	37.6	37.2	37.1	37.1	37.4	38.6

Table 4: Panel regressions of changes in equity issuance on changes in market liquidity: Controlling for macro conditions

This table reports coefficient estimates of panel regressions using quarterly data from 38 countries (NYSE and Nasdaq counted separately) over the period 1995Q1-2014Q4. The dependent variable is the change in the number of equity issues (common stock IPOs and SEOs from SDC). Independent variables include lead, contemporaneous, and lagged changes in local market liquidity, local market returns, business cycle proxies (GDP growth, sales growth, and leading economic indicator growth), asymmetric information proxies (changes in local stock price synchronicity and changes in idiosyncratic volatility), and lagged dependent variables. Variable definitions are in the Appendix. In Model (1) of this table, we reproduce the benchmark regression Model (2) of Table 2. All variables are demeaned and standardized by country, so any coefficient can be interpreted as the effect in standard deviations on the dependent variable of a one standard deviation shock to the independent variable corresponding to that coefficient. Standard errors are clustered by country and quarter. Significance at the 1%, 5% and 10% level is indicated by ***, **, and *.

Table 4, continued

Dependent variable:	*Δ number of issues (t)*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ market liquidity (t+1)	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Δ market liquidity (t)	0.08***	0.08***	0.07***	0.08***	0.08***	0.08***	0.06***
Δ market liquidity (t-1)	0.08**	0.04*	0.05*	0.06**	0.09***	0.08**	0.05*
Δ market liquidity (t-2)	0.07***	0.07***	0.07***	0.08***	0.07***	0.07***	0.08***
Δ market liquidity (t-3)	0.08***	0.07***	0.07***	0.07***	0.08***	0.08***	0.09***
Δ market liquidity (t-4)	0.02	0.02	0.02	0.02	0.02	0.02	0.03
market returns (t+1)	0.01	-0.02	-0.02	-0.02	0.00	0.01	-0.03
market returns (t)	0.11***	0.10***	0.11***	0.10***	0.11***	0.10***	0.10***
market returns (t-1)	0.10***	0.07**	0.06**	0.06**	0.10***	0.09***	0.05
market returns (t-2)	0.05*	0.07*	0.07*	0.07*	0.05*	0.05*	0.07
market returns (t-3)	0.07***	0.07***	0.07***	0.08***	0.08***	0.07***	0.09***
market returns (t-4)	0.04	0.02	0.02		0.04	0.04	0.02
GDP growth (t+1)		0.00					-0.02
GDP growth (t)		-0.03					0.00
GDP growth (t-1)		0.03					0.05
GDP growth (t-2)		-0.02					-0.03
GDP growth (t-3)		-0.02					-0.08
GDP growth (t-4)		0.03					0.08*
sales growth (t+1)			0.00				0.01
sales growth (t)			0.04				0.04
sales growth (t-1)			-0.05				-0.05
sales growth (t-2)			-0.05**				-0.05**
sales growth (t-3)			0.04*				0.05***
sales growth (t-4)			0.00				-0.01
leading economic indicator growth (t+1)				0.03			0.15
leading economic indicator growth (t)				0.13			-0.46*
leading economic indicator growth (t-1)				-0.31			0.74**
leading economic indicator growth (t-2)				0.48			-0.69*
leading economic indicator growth (t-3)				-0.56			0.43
leading economic indicator growth (t-4)				0.45			-0.14
Δ idiosyncratic volatility (t+1)				-0.17	0.03		0.02
Δ idiosyncratic volatility (t)					-0.01		-0.07
Δ idiosyncratic volatility (t-1)					0.01		0.01
Δ idiosyncratic volatility (t-2)					0.07***		0.05
Δ idiosyncratic volatility (t-3)					0.02		0.01
Δ idiosyncratic volatility (t-4)					0.02		0.05*
Δ stock price synchronicity (t+1)						0.04	0.06**
Δ stock price synchronicity (t)						0.00	-0.01
Δ stock price synchronicity (t-1)						-0.01	-0.01
Δ stock price synchronicity (t-2)						-0.01	-0.02
Δ stock price synchronicity (t-3)						0.01	0.04
Δ stock price synchronicity (t-4)						0.01	0.04
Δ number of issues (t-1)	-0.56***	-0.58***	-0.58***	-0.58***	-0.56***	-0.56***	-0.58***
Δ number of issues (t-2)	-0.37***	-0.38***	-0.39***	-0.37***	-0.37***	-0.37***	-0.38***
Δ number of issues (t-3)	-0.23***	-0.25***	-0.25***	-0.25***	-0.24***	-0.23***	-0.25***
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes
$N_{observations}$	2,831	2,322	2,155	2,303	2,815	2,815	2,091
$N_{countries}$	38	32	30	31	38	38	29
R^2_{within} (%)	26.9	28.5	28.6	28.3	27.2	27.0	29.4
R^2 (%)	37.0	40.3	41.3	40.0	37.3	37.1	42.1

Table 5: The determinants of the relation between changes in equity issuance and changes in liquidity

This table reports coefficient estimates of panel regressions using quarterly data from 38 countries (NYSE and Nasdaq counted separately) over the period 1995Q1-2014Q4. The dependent variables are the change in the number of equity issues and the change in the proceeds from equity issues (common stock IPOs and SEOs from SDC). Independent variables include lead, contemporaneous, and lagged changes in local market liquidity, local market returns, and lagged dependent variables. In Panel A, Model (1) reproduces the benchmark regression Model (2) of Table 2. In Models (2) and (3), the sample of issues is split into those by firms with positive and negative return on assets (ROA) in the year of the issue. In Models (4) and (5), the countries are split into financially developed and financially emerging, based on their average stock market capitalization to GDP over the sample period. Model (6) is the same as Model (1) but excludes the crisis period 2008Q1-2011Q4. Model (7) only includes the crisis period. In Panel B, Model (1) again reproduces the benchmark regression Model (2) of Table 2. In Models (2) and (3), the sample consists of only SEOs; in Models (4) and (5), the sample consists of only IPOs. Additionally, in Models (3) and (5), the crisis period is excluded. In Models (6) and (7), changes in proceeds are used as the dependent variable; in Model (7) the crisis period is excluded. Variable definitions are in the Appendix. All variables are demeaned and standardized by country, so any coefficient can be interpreted as the effect in standard deviations on the dependent variable of a one standard deviation shock to the independent variable corresponding to that coefficient. Standard errors are clustered by country and quarter (except in Model (5) of Panel B, where only clustering by quarter is used). Significance at the 1%, 5% and 10% level is indicated by ***, **, and *.

Panel A: Sample splits of ROA>0 vs. ROA<0, financially developed vs. emerging countries, and without crisis vs. crisis only

Dependent variable:	***Δ number of issues (t)***						
	(1) full sample	(2) ROA>0	(3) ROA<0	(4) Fin. Developed	(5) Fin. Emerging	(6) without crisis	(7) crisis only
Δ market liquidity (t+1)	-0.02	-0.01	-0.02	-0.02	-0.02	-0.04	0.01
Δ market liquidity (t)	0.08***	0.08***	0.05*	0.12***	0.04	0.08***	0.08*
Δ market liquidity (t-1)	0.08**	0.08***	0.04	0.14***	0.02	0.08***	0.08
Δ market liquidity (t-2)	0.07***	0.06***	0.02	0.06*	0.07*	0.07***	0.08**
Δ market liquidity (t-3)	0.08***	0.06***	0.05*	0.10***	0.06**	0.09***	0.06**
Δ market liquidity (t-4)	0.02	0.00	0.02	0.06	-0.02	0.01	0.04
market returns (t+1)	0.01	-0.02	0.04*	0.02	-0.02	-0.01	0.09
market returns (t)	0.11***	0.10***	0.06**	0.13***	0.08**	0.10***	0.14**
market returns (t-1)	0.10***	0.08**	0.05*	0.08*	0.11***	0.10***	0.06
market returns (t-2)	0.05*	0.04	-0.03	0.05	0.06	0.08**	-0.12**
market returns (t-3)	0.07***	0.02	0.02	0.10***	0.07**	0.07***	0.07
market returns (t-4)	0.04	0.05	-0.01	0.06	0.03	0.07*	-0.17***
Δ number of issues (t-1)	-0.56***	-0.60***	-0.64***	-0.51***	-0.63***	-0.54***	-0.61***
Δ number of issues (t-2)	-0.37***	-0.40***	-0.40***	-0.31***	-0.46***	-0.37***	-0.39***
Δ number of issues (t-3)	-0.23***	-0.21***	-0.20***	-0.24***	-0.25***	-0.23***	-0.25***
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes
$N_{observations}$	2,831	2,869	2,869	1,552	1,279	2,224	607
$N_{countries}$	38	38	38	20	18	38	38
R^2_{within} (%)	26.9	28.6	29.9	25.3	32.1	26.3	31.0
R^2 (%)	37.0	36.3	33.1	38.8	42.6	34.7	44.2

Table 5, continued

Panel B: Sample splits of SEOs vs. IPOs (with and without crisis) and proceeds as dependent variable (instead of number of issues)							
Dependent variable:			***Δ number of issues (t)***			***Δ proceeds (t)***	
Equity issues included:	IPOs+SEOs	SEOs	SEOs	IPOs	IPOs	IPOs+SEOs	IPOs+SEOs
	(1) full sample	(2) full sample	(3) without crisis	(4) full sample	(5) without crisis	(6) full sample	(7) without crisis
Δ market liquidity (t+1)	-0.02	-0.02	-0.05*	-0.01	-0.02	-0.01	-0.04**
Δ market liquidity (t)	0.08***	0.09***	0.06**	0.02	0.05	0.02	0.01
Δ market liquidity (t-1)	0.08**	0.08**	0.07***	0.05***	0.07***	0.00	0.02
Δ market liquidity (t-2)	0.07***	0.05**	0.03**	0.07***	0.09***	0.01	0.03
Δ market liquidity (t-3)	0.08***	0.08***	0.07***	0.03**	0.06***	0.03	0.05**
Δ market liquidity (t-4)	0.02	0.01	0.00	-0.01	-0.01	-0.02	-0.02
market returns (t+1)	0.01	0.01	-0.01	0.00	0.00	0.00	0.01
market returns (t)	0.11***	0.11***	0.07**	0.05	0.07**	0.07**	0.05*
market returns (t-1)	0.10***	0.06**	0.08***	0.09***	0.08***	0.12***	0.13***
market returns (t-2)	0.05*	0.03	0.07**	0.02	0.03	0.03	0.05
market returns (t-3)	0.07***	0.06**	0.04**	0.06**	0.06*	0.07***	0.06**
market returns (t-4)	0.04	0.00	0.02	0.07**	0.08***	0.03	0.06*
Δ number of issues (t-1)	-0.56***	-0.55***	-0.56***	-0.63***	-0.63***		
Δ number of issues (t-2)	-0.37***	-0.37***	-0.39***	-0.35***	-0.36***		
Δ number of issues (t-3)	-0.23***	-0.23***	-0.21***	-0.19***	-0.20***		
Δ proceeds (t-1)						-0.65***	-0.65***
Δ proceeds (t-2)						-0.45***	-0.45***
Δ proceeds (t-3)						-0.25***	-0.24***
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes
$N_{observations}$	2,831	2,797	2,190	2,587	2,037	2,831	2,225
$N_{countries}$	38	38	38	38	38	38	38
R^2_{within} (%)	26.9	26.4	26.9	30.2	30.5	32.1	32.4
R^2 (%)	37.0	33.0	32.2	41.3	40.3	38.9	37.8

Table 6: Out-of-sample prediction of changes in equity issuance with changes in liquidity

This table reports mean-squared prediction errors (MSPEs) of out-of-sample forecasts of changes in the number of issues (common stock IPOs and SEOs from SDC) using quarterly data from 38 countries (NYSE and Nasdaq counted separately) over the period 1995Q1-2014Q4. Iteratively, coefficients are estimated in-sample using a panel regression with quarter fixed effects, and are used to make an one-quarter ahead out-of-sample forecast of equity issuance changes. After each iteration, the in-sample window is expanded by one quarter. In Panel A, the in-sample estimation window initially includes the first 30% of the sample period; in Panel B, the first 50%; in Panel C, the first 70%. Independent variables include lagged changes in market liquidity, lagged market returns, and lagged changes in the number of issues. Results are presented both with and without the crisis period 2008Q1-2011Q4. Variable definitions are in the Appendix. All variables are demeaned and standardized by country. The columns labelled "DM-test" indicate whether the model is significantly different from the model indicated in parentheses, based on Diebold-Mariano (1995) tests. Significance at the 1%, 5% and 10% level is indicated by ***, **, and *.

Panel A: In-sample estimation window of first 30% of sample period

	Dependent variable:	***Δ number of issues***			
		with crisis		without crisis	
Model	Independent variables	MSPE	DM-test	MSPE	DM-test
(1)	*average (Δ number of issues (1:t))*	1.0851		0.9293	
(2)	*Δ market liquidity (t-1:t-3)*	1.0677	(1): ***	0.9086	(1): ***
(3)	*Δ number of issues (t-1:t-3) + market returns (t-1:t-3)*	0.7853		0.6806	
(4)	*Δ number of issues (t-1:t-3) + market returns (t-1:t-3) + + Δ market liquidity (t-1:t-3)*	0.7823	(3): –	0.6705	(3): **

Panel B: In-sample estimation window of first 50% of sample period

	Dependent variable:	***Δ number of issues***			
		with crisis		without crisis	
Model	Independent variables	MSPE	DM-test	MSPE	DM-test
(1)	*average (Δ number of issues (1:t))*	1.2437		0.9210	
(2)	*Δ market liquidity (t-1:t-3)*	1.2200	(1): ***	0.8966	(1): ***
(3)	*Δ number of issues (t-1:t-3) + market returns (t-1:t-3)*	0.8885		0.6663	
(4)	*Δ number of issues (t-1:t-3) + market returns (t-1:t-3) + + Δ market liquidity (t-1:t-3)*	0.8843	(3): –	0.6614	(3): –

Panel C: In-sample estimation window of first 70% of sample period

	Dependent variable:	***Δ number of issues***			
		with crisis		without crisis	
Model	Independent variables	MSPE	DM-test	MSPE	DM-test
(1)	*average (Δ number of issues (1:t))*	1.4155		1.1053	
(2)	*Δ market liquidity (t-1:t-3)*	1.3905	(1): ***	1.0772	(1): ***
(3)	*Δ number of issues (t-1:t-3) + market returns (t-1:t-3)*	1.0306		0.7865	
(4)	*Δ number of issues (t-1:t-3) + market returns (t-1:t-3) + + Δ market liquidity (t-1:t-3)*	1.0305	(3): –	0.7766	(3): *

Table 7: Robustness checks

This table reports coefficient estimates of panel regressions using quarterly data from 38 countries (NYSE and Nasdaq counted separately) over the period 1995Q1-2014Q4. The dependent variable is the change in the number of equity issues (common stock IPOs and SEOs from SDC). Independent variables include lead, contemporaneous, and lagged changes in local market liquidity, local market returns, and lagged dependent variables. Model (1) reproduces the benchmark regression Model (2) of Table 2. In Model (2), we do not demean the variables. In Model (3), we exclude the quarter fixed effects. In Model (4), we exclude countries with an exchange merger (Brazil, Colombia, Indonesia, Japan, and Russia). In Model (5), we include data from 1990 (instead of 1995) until 2014. In Model (6), we exclude the countries Australia, Canada, India, and Japan, which have a large number of small issues. Variable definitions are in the Appendix. All variables are demeaned (except those in Model (2)) and standardized by country, so any coefficient can be interpreted as the effect in standard deviations on the dependent variable of a one standard deviation shock to the independent variable corresponding to that coefficient. Standard errors are clustered by country and quarter. Significance at the 1%, 5% and 10% level is indicated by ***, **, and *.

Dependent variable:	***Δ number of issues (t)***					
	(1) full sample	(2) no demeaning	(3) no quarter FE	(4) no merged exch.	(5) 1990-2014	(6) no AUS, CAN, IND, JPN
Δ market liquidity (t+1)	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02
Δ market liquidity (t)	0.08***	0.08***	0.09***	0.09***	0.08***	0.07***
Δ market liquidity (t-1)	0.08**	0.08**	0.09**	0.11***	0.09***	0.08**
Δ market liquidity (t-2)	0.07***	0.07***	0.07***	0.08***	0.07***	0.06***
Δ market liquidity (t-3)	0.08***	0.07***	0.08***	0.08***	0.08***	0.08***
Δ market liquidity (t-4)	0.02	0.02	0.00	0.01	0.02	0.01
market returns (t+1)	0.01	0.00	-0.01	0.00	0.00	-0.01
market returns (t)	0.11***	0.10***	0.11***	0.11***	0.09***	0.10***
market returns (t-1)	0.10***	0.09***	0.13***	0.10***	0.09***	0.09***
market returns (t-2)	0.05*	0.04	0.03	0.04	0.05*	0.07**
market returns (t-3)	0.07***	0.06***	0.02	0.07***	0.07***	0.07***
market returns (t-4)	0.04	0.03	0.01	0.06*	0.05*	0.03
Δ number of issues (t-1)	-0.56***	-0.56***	-0.58***	-0.56***	-0.55***	-0.57***
Δ number of issues (t-2)	-0.37***	-0.37***	-0.34***	-0.35***	-0.36***	-0.37***
Δ number of issues (t-3)	-0.23***	-0.23***	-0.26***	-0.22***	-0.23***	-0.21***
Quarter fixed effects	yes	yes	no	yes	yes	yes
$N_{observations}$	2,831	2,831	2,831	2,511	3,126	2,520
$N_{countries}$	38	38	38	33	38	34
R^2_{within} (%)	26.9	26.8	31.2	26.7	26.0	26.8
R^2 (%)	37.0	36.9	31.2	37.7	36.0	37.1