Online Appendix for
“External Equity Financing Shocks, Financial Flows, and Asset Prices”

FREDERICO BELO, XIAOJI LIN, AND FAN YANG

This appendix contains tables and figures that supplement the analysis in the paper. Section A presents the asset pricing test results with equity issuance cost shocks constructed using alternative definitions of equity issuance. Section B presents the asset pricing test results with equity issuance cost shocks constructed by taking averages of portfolio-level equity issuance shocks across portfolios sorted by various firm characteristics. Section C presents the asset pricing test results for equity issuance cost shocks after controlling for other return factors or macroeconomic shocks. Section D presents the asset pricing test results using debt issuance cost shocks.

1Frederico Belo is from University of Minnesota and National Bureau of Economic Research. Xiaoji Lin is from Department of Finance, Fisher College of Business, The Ohio State University. Fan Yang is from Faculty of Business and Economics, The University of Hong Kong.
A. Alternative definitions of equity issuance

In this section, we reexamine our asset pricing tests using alternative measures of equity issuance shocks. In constructing all these measures, we exclude utility and financial firms (SIC code from 4900 to 4999 and from 6000 to 6999) from our sample as in our baseline measure of issuance shocks in the paper to be consistent with our portfolio formation. Consistent with our baseline asset pricing tests, we use 5 book-to-market portfolios, 5 investment portfolios, and 5 size portfolios as test assets, and we perform the tests using both value- and equal-weighted average returns. Tables 1 and 2 report the key results from the asset pricing tests using value-weighted and equal-weighted average returns, respectively. To facilitate the comparison, we report the corresponding asset pricing results in the baseline measure of issuance shocks (0. Baseline), which are the results reported in the main draft.

We examine the following alternative measures of equity issuance (the numbers correspond to the measures reported in Tables 1 and 2):

1. Gross equity issuance: We use gross issuance (annual Compustat data item SSTK) to compute the fraction of equity issuance firms. In particular, we define a issuance firm in a year if its SSTK is positive. If SSTK is missing or zero, we set the firm as non-issuance. Then, we compute the fraction of issuance firms for every year. The good performance of the two-factor model reported in the paper is not driven by cash dividend or equity repurchase, but gross equity issuance of firms.

2. Net equity issuance with alternative cutoffs: Compustat equity issuance item does not only include normal equity issuances (e.g. SEO’s), but also equity issuances that are due to the exercising of employees’ stock options. These equity issuances are usually very small in magnitude, but are very frequent. To exclude these equity issuances from our measure, we set a cutoff other than zero for equity issuance
firms. In particular, we define a firm is issuing in year $t$ if its net equity issuance at year $t$ is larger than 5% of its total book asset at year $t-1$. We also try other cutoffs between 0% and 5% or using firm size measures other than book asset. The asset pricing results remain very close to our baseline case.

3. Change in log split-adjusted shares: Other than using the cash flow statement items, we define net equity issuance as change in log split-adjusted shares following Fama and French (2008). The split-adjusted shares are the products of common shares outstanding (annual Compustat data item CSHO) and the stock split and dividend adjustment factor (annual Compustat data item AJEX). A firm is issuing if the change is positive. We remove observations with missing change in log split-adjusted shares.

4. Monthly adjusted CRSP shares: We use CRSP data to construct a measure of equity issuance following Boudoukh, Michaely, Richardson, and Roberts (2007). We only include common stocks (CRSP data item SHRC= 10 or 11) traded in three major exchanges (CRSP data item EXCHCD = 1, 2, or 3). The monthly net equity issuance is computed as follows

$$ (\text{shrout}_t \times \text{cfacshr}_t - \text{shrout}_{t-1} \times \text{cfacshr}_{t-1}) \times (\text{prc}_t / \text{cfapr}_t + \text{prc}_{t-1} / \text{cfapr}_{t-1}) / 2 $$

where $\text{shrout}$ is the number of shares outstanding, $\text{cfacshr}$ is the cumulative factor to adjust shares, $\text{cfacpr}$ is the cumulative factor to adjust price, and $\text{prc}$ is the share price. We annualize the monthly issuance data to get annual fraction of issuance.\(^2\) A firm is defined as a issuance firm if its net equity issuance is positive.

\(^2\)We have also considered estimating the two-factor model at the monthly frequency using monthly equity issuance data. However, the monthly equity issuance data exhibits a very strong seasonality, and the pattern of seasonality appears to vary over time. To avoid this seasonality, we perform our analysis at the annual frequency using annual data.
for any of the twelve months of a year.

5. Number of SEOs: We use annual log growth of number of SEOs as a measure of issuance shocks. Specifically, we obtain monthly numbers of SEOs from 1971 to 2004 from Jay Ritter’s website. We compute the log numbers of SEOs at annual frequency and apply the one-sided HP filter to the time series. Then, we estimate the VAR system controlling for TFP as in our baseline case. The innovation part to log number of SEOs is defined as ICS.

6. Number of IPOs: We use annual log growth of number of IPOs as a measure of issuance shocks. More specifically, we download annual numbers of IPOs from 1971 to 2010 from Jeffrey Wurgler’s website (IPO volume extended from Ibbotson, Sindelar, and Ritter (1994)). We apply the same method as for the number of SEOs to extract the ICS from the number of IPOs.

Overall, the main results appear to be consistent across the different equity issuance measures.

B. Average equity issuance cost shocks across portfolio-level ICS

To show that our main results (in particular, the construction of ICS) are not driven by size, age, or industry effects, we perform robustness checks in which we sort firms into portfolios using firm characteristics (size, age, or industry) and then construct ICS for each portfolio separately following the same procedure as in constructing our baseline ICS. After that, we take average portfolio-level ICS across all portfolios to construct the market-level ICS. By taking the average across the portfolios, we mitigate the concern that the portfolio characteristic is the driver of the ICS measure.

In constructing these alternative measures, we exclude utility and financial firms (SIC code from 4900 to 4999 and from 6000 to 6999) from our sample as in our baseline case to
be consistent with our portfolio formation. As before, consistent with our baseline asset pricing tests reported in the paper, we use 5 book-to-market portfolios, 5 investment portfolios, and 5 size portfolios as test assets, and we perform the tests using both value- and equal-weighted average returns. Tables 3 and 4 report the key results from the asset pricing tests using value-weighted and equal-weighted average returns, respectively. To facilitate the comparison, we report the corresponding asset pricing results in the baseline model (0. Baseline), which are the results reported in the main draft. We examine the results across the following sorts (the numbers correspond to the measures reported in Tables 3 and 4):

1. Size: We use total book asset (annual Compustat data item AT) as the measure for firm size and sort all Compustat firms into five portfolios. For each portfolio, we construct portfolio-level ICS based on net equity issuance. Then, we take equal average across five time series of portfolio-level ICS to get the time series of market-level ICS. We use the market-level ICS as the alternative ICS factor to redo all the asset pricing tests.

2. Age: We define a firm’s age as the difference in months between January at current year and the month and year of its first observation in CRSP. We sort all CRSP/Compustat firms by their age and split them into 5 portfolios based on NYSE breakpoints.

3. Industry: We split Compustat firms excluding financial and utility firms into 9 industry portfolios based on Fama and French’s definitions of 10 industries. Among them, the utility industry is totally removed and financial firms are removed from the portfolio of other industries.

Overall, the correlation between these alternative ICS and the baseline is very high
(above 82% across the three cases). In addition, the main asset pricing results appear to be consistent across these alternative measures.

C. Alternative control variables in constructing equity issuance shocks

We control the ICS measure for other return factors or macroeconomic shocks. Specifically, we estimate a simple linear regression as follows

\[ \text{ICS}_t = a + b \times g_t + e_t, \]

where \( g_t \) denotes a control variable. Then, we define the residual \( e_t \) as a controlled ICS. For those control variables that are levels rather than innovations, we use their annual log growth as \( g_t \).

We test the two-factor model including the market factor and the controlled ICS. Again, we use value weighted and equal weighted 5 book-to-market portfolios, 5 investment portfolios, and 5 size portfolios as test assets. Tables 5 and 6 report the asset pricing tests using value weighted portfolios and equal weighted portfolios as test assets respectively. The control variables that we check are listed as follows:

1. Investment shocks: We use the quality adjusted price of new equipment and software from 1947-2012 to extract investment shocks following the empirical procedure described in Papanikolaou (2011).³

2. Liquidity shocks: We download the liquidity factor in Pastor and Stambaugh (2003) from Robert F. Stambaugh’s website. The data is from 1962-2012. We take the sum of the twelve months innovations in aggregate liquidity in a year to obtain annual time series of liquidity shocks.

³Thanks to Ryan Israelsen for sharing the data.
3. Collateral constraint shocks: We use the collateral constraint shocks (financial shocks) from Jermann and Quadrini (2012).\(^4\) The data is from 1985-2010. We sum up the four quarters innovations in to financial conditions (debt market) in a year to obtain annual time series of collateral constraint shocks.

4. Sentiment index: We download the sentiment indices constructed in Baker and Wurgler (2006) from Jeffrey Wurgler’s website. The data is from 1965-2010. We use the changes in the orthogonal sentiment index as a control variables. The asset pricing results are reported in Tables 5 and 6. We also check the other sentiment index in their paper. The test results are very close.

5. Aggregate cost of external finance: We obtain the time series of aggregate costs of external finance from Eisfeldt and Muir (2014). In contrast to equity issuance shocks, these costs include both equity and debt financing costs. Their data is from 1980-2010. We use the changes in the aggregate costs as a control variable.

6. Uncertainty shocks: To obtain long time series of annual uncertainty shocks of aggregate economy, we compute the realized variance of the twelve months log industry production growth in a year following Bansal, Kiku, Shaliastovich, and Yaron (2014). The monthly industry production index is from FRED Economic Data. The data is from 1919-2012. We use the change in annual realized variances as a measure for uncertainty shocks.

7. Leverage ratio of securities broker-dealers: We use annual growth of market leverage of broker and dealer firms from Adrian, Etula, and Muir (2013) as a control variable. They find that this factor also help price the cross sectional stock returns. The factor is from 1972-2012.

\(^4\)Thanks to Vincenzo Quadrini for sharing the data.
8. Stock market factor: We use annual stock market factor from Ken French’s website as a control variable.

9. Price to dividend ratio: We use monthly value-weighted market return and value-weighted market capital gain from CRSP to construct monthly time series of price to dividend ratios of the stock market. Then, we use annual changes of log price to dividend ratios at every December as a control variable. The data is available from 1926-2012.

10. Aggregate cash holdings: We aggregate cash holdings of annual Compustat firms. To be consistent with our baseline ICS formation, we exclude utility and financial firms. We use annual log aggregate cash holdings growth as a control variable. The data is from 1956-2012.

Overall, the correlation between these alternative (controlled) ICS and the baseline ICS is high (above 94% across the three cases). This high correlation does not mean that the control variables are not correlated with the ICS. For example, the correlation between ICS and the sentiment index is 31%. In addition, the slope coefficient from the regression of ICS on the sentiment index is positive (2.1) and statistically significant (t-stat of 2.5), and the regression R2 is 9%. The high correlation between ICS and controlled ICS simply means that ICS is not perfectly explained by these control variables, consistent with the interpretation that it is a comprehensive measure of financial market conditions.

As a result of the high correlation of ICS and the controlled ICS measures, the main asset pricing results obtained using the controlled ICS are similar to those reported in the main text.

**D. Debt issuance shocks**
In this section, we construct debt issuance cost shocks using the fraction of firms raising debt by following the same empirical procedure as in the construction of ICS for equity issuance. Specifically, we define a firm as a debt issuer if the change of its total debt including short term (annual Compustat item DLC) and long term debt (annual Compustat item DLTT) is positive. We then extract the innovations from a VAR that includes this fraction of debt issuers and aggregate TFP as the two state variables. We define the shocks to the fraction of debt issuers as debt issuance cost shock (DICS), which we then compare to ICS used in the paper.

Figure 1 reports the time series of fraction of equity and debt issuers, and the corresponding ICS and DICS constructed both from equity and debt. As described in the main test, the correlation between the two shocks is small and negative (-0.16).

Table 7 reports the asset pricing test results using DICS. This table replicates Table 2 of the main draft, but now using the debt issuance cost shock proxy. Taken together, exposure to debt issuance cost shocks does not seem to price the cross section of the stock returns considered here.
References


Table 1: Asset pricing tests for alternative measures of equity issuance with value weighted portfolios

This table reports the important estimates from the asset pricing tests of the CAPM and the two-factor model (stock market and alternative ICS) using three sets of value weighted portfolios as test assets. These three sets of portfolios include 5 book-to-market portfolios (5 BM), 5 investment portfolios (5 IK), and 5 size portfolios (5 SZ). The estimation of the asset pricing models is by the generalized method of moments (GMM) using the standard asset pricing moment condition \( E_T[\hat{r}_{t+1} M_{t+1}] = 0 \), in which \( M_{t+1} = 1 - b_M \times MKT_t - b_I \times ICS_t \) is the model specific stochastic discount factor (SDF), \( MKT_t \) is the (demeaned) market excess return, \( ICS_t \) is the (demeaned) ICS, and \( b_M \) and \( b_I \) are the corresponding risk factor loadings on the SDF. In the table, Correl.(ICS, Base.) is the correlation between ICS shocks constructed using alternative measure of equity issuance shocks and the baseline ICS shocks in the paper; Cov(ICS, Spread) the univariate covariance between the spread portfolio return and the ICS factor; spread 2F alphas are the pricing errors (abnormal returns) implied by the estimation of the 2 factor model for three spread portfolios. The pricing errors are inferred from the errors on the moment condition estimated above in the 1st stage GMM; factor loadings are the 2nd stage GMM estimates of the risk factor loadings in the SDF. The estimation is performed using all value weighted portfolios. MAE is the estimation implied mean absolute pricing errors (mean of the CAPM alphas or the two-factor model alphas) for the 1st stage GMM. The sample period varies depending on the availability of measures of ICS. All the t-statistics are adjusted using Newey West corrections with 3-year lags.

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<tr>
<th>Measure (ICS, Base.)</th>
<th>Correl. (ICS, Base.)</th>
<th>Cov(ICS, Spread)</th>
<th>Spread 2F Alpha</th>
<th>Factor loadings</th>
<th>CAPM MAE</th>
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Table 3: Asset pricing tests for ICS aggregated from alternative groups of firms with value weighted portfolios

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Table 5: Asset pricing tests for ICS controlled for return factors or macroeconomic shocks with value weighted portfolios

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<th>Factor loadings</th>
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Table 6: Asset pricing tests for ICS controlled for return factors or macroeconomic shocks with equal weighted portfolios

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Table 7: Debt issuance cost shocks and systematic risk

This table reports the average equal- and value weighted return characteristics of three sets of portfolio sorts: 5 book-to-market portfolios (5 BM), 5 investment portfolios (5 IK), and 5 size portfolios (5 SZ). For each portfolio sort, the table reports the characteristics of the portfolios 1 (Low, L), and 5 (High, H), and the high-minus-low portfolio (H-L). In addition, the table reports the asset pricing tests on these portfolios using the following two asset pricing models as the benchmarks: the CAPM, in which the return on the market (MKT) is the only pricing factor, and a two factor model, in which the return on the market and the debt issuance cost shock (DICS) are the two factors. The estimation of the asset pricing models is by the generalized method of moments (GMM) using the standard asset pricing moment condition:

$$E_t \left[ r_{it+1}^e M_{i+1} \right] = 0,$$

where $M_{i+1} = 1 - b_M \times MKT_t - b_I \times DICS_t$ is the model specific stochastic discount factor (SDF), $MKT_t$ is the (demeaned) market excess return, $DICS_t$ is the (demeaned) DICS, and $b_M$ and $b_I$ are the corresponding risk factor loadings on the SDF. Panel A reports the following characteristics: $E[r^e]$ is the average annual portfolio excess stock return (in percentage and in excess of the risk free rate); SR is the portfolio Sharpe ratio (average return-to-return standard deviation ratio); $[t]$ are heteroscedasticity and autocorrelation consistent $t$-statistics (Newey-West, with 3 year lag); $Cov_{MKT}$ is the univariate covariance between the portfolio excess return and the MKT factor; and $Cov_{DICS}$ is the univariate covariance between the portfolio excess return and the DICS factor; $\alpha$ and $\alpha^{2F}$ are the pricing errors (abnormal returns) implied by the estimation of the CAPM and the 2 factor model, respectively. The pricing errors are inferred from the errors on the moment condition estimated above. Panel B reports the 1st stage and 2nd stage GMM estimates of the risk factor loadings in the SDF with the corresponding $t$-statistic in parenthesis. The estimation is performed separately across each portfolio sort, and using all portfolio sorts together (All). MAE is the estimation implied mean absolute pricing errors (mean of $|\alpha|$ or $|\alpha^{2F}|$). The data is annual from 1975 to 2012.

### Panel A: Portfolio return characteristics and pricing errors

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Table 8: Debt issuance cost shocks and systematic risk (cont.)

Panel B: Risk factor loadings

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Figure 1: Equity and debt issuance shocks

This figure compares the time series of the fraction of firms issuing equity and the fraction of firms issuing debt in the cross section (top Panel), and the time series of the out-of-sample equity issuance cost shock (ICS) and the out-of-sample debt issuance cost shock (DICS) obtained as the residuals from a VAR(1) system (bottom Panel). Shaded bars are NBER recession years. The data is annual from 1971 to 2012.