Cash Shortfall as a Predictor of Equity Issuance Decisions: The Role of Current Cash Holdings and Expected Future Cash Flows

Anna Rossi and Petri Sahlström

Abstract

This paper examines the role of cash shortfall components, namely existing cash holdings and expected future cash flows, in equity issue decisions. We find that the relation between cash shortfall and equity issue likelihood is attributable to the expected future cash flow component, whereas existing cash balance is not associated with the likelihood of equity issues. Furthermore, our findings indicate that cash-rich issuers receive more issue proceeds and retain a greater portion of these proceeds in their cash accounts. Results of our additional analyses indicate that target cash level considerations are important in explaining the documented regularities.

Keywords:

equity issues, cash holdings, cash shortfall

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1. Introduction

Why do firms issue equity? Myers and Majluf's (1984) pecking-order theory predicts that firms raise external capital when their internal funds are insufficient to finance valuable investment projects. In this framework, the answer to the question is that firms undertake equity issues primarily for immediate cash needs.[1, 2]

More recently, DeAngelo, DeAngelo and Stulz (2010) propose to empirically access the magnitude of immediate cash needs with a measure of cash shortfall – a probability of depletion of existing cash savings in the absence of capital raising. The cash shortfall measure reflects how well a firm can finance its planned expenditures with cash on hand. Employing the definition of cash needs similar to DeAngelo, DeAngelo and Stulz (2010), Huang and Ritter (2021) and McLean and Palazzo (2017) provide further evidence that cash squeeze is an economically important predictor of both debt and equity issues. While the measure of cash shortfall is intuitively appealing, its empirical validity has not been explored in the existing studies. Specifically, is the assumption that a firm would spend all of its existing cash holdings to cover its planned expenditures plausible?

In this study, we evaluate the empirical power of the cash shortfall measure by examining how its components – existing cash balance and expected cash flows – are related to equity issue policies. If both components represent the sources of liquidity considered by firms in their financing policies, we expect both higher expected cash flows and higher existing cash holdings to be associated with a lower probability of equity issue, and, conditional on an issue, with lower issue proceeds.

To test our hypotheses, we employ a sample of U.S. public equity issuers spanning the period of 1986-2014. As a first step, we estimate a logit model of equity issue probability, where we control for known determinants of equity issues and the two components of cash shortfall. The results of these tests show that the impact of cash shortfall on equity issue likelihood is driven entirely by the expected cash flow component of the cash shortfall, whereas there is no relation between pre-issue cash balance and the probability of equity issue. Next, we examine whether the two components explain the size of the equity issue. If issuers plan to match the issue proceeds to their cash shortfall, then, conditional on the issue, we expect both components of the cash shortfall to be inversely related to the amount of issue proceeds. In these tests, we again find that the expected cash flow is inversely related to the size of the equity issue, whereas pre-issue cash balance exhibits a positive association with the size of the equity issue – the opposite of what the "immediate cash needs" hypothesis predicts.

Finally, we perform several additional analyses to understand the drivers of the counterintuitive results with respect to the cash holdings component of cash shortfall and the equity issue policies. First, we examine the savings rates of issue proceeds of equity issuers in the year

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[1] Other prominent explanations for equity issue policies include market timing (e.g., Loughran and Ritter, 1995; Baker and Wurgler, 2002) and capital structure rebalancing (e.g., Shyam-Sunder and Myers, 1999; Welch, 2004; Leary and Roberts, 2005).

[2] Pecking order theory makes several other predictions with respect to corporate capital structure and financing choices. Perhaps the most well-known one is that companies should finance investment projects first with internal cash flows, then with debt and turn to equity financing only as a last resort. The central assumption underlying this prediction is an existence of information asymmetries between managers and potential capital providers, that leads to losses associated with capital raising. See for example, Shyam-Sunder and Myers (1999), Frank and Goyal (2003), Fama and French (2005) for a broader discussion on the predictions and implications of the pecking order theory, and Bharath, Pasquariello, and Wu (2009), Autore and Kovacs (2010), Akyol, Cooper, Meoli, and Vismara (2014), Cattaneo, Meoli, and Vismara (2015) for the role of information asymmetries in corporate financing policies.

of and several years following the issue. If equity issuers take into account their existing cash holdings while planning their expenditures, one would expect issuers with higher pre-issue cash holdings to dissipate the issue proceeds at a faster rate relative to issuers with lower pre-issue cash holdings. To test this prediction, we estimate saving rates of equity issue proceeds following the approach of McLean (2011), however, we fail to find evidence supportive of our predictions. In fact, the results indicate that equity issuers holding higher pre-issue cash reserves retain more of the issue proceeds in their cash accounts.

Another plausible explanation for why firms do not consider the existing cash holdings as a source of liquidity is because of their reluctance to deviate from their optimal cash ratios. To test for this explanation, we determine optimal and suboptimal levels of cash following the approach of Opler, Pinkowitz, Stulz, and Williamson (1999) and examine how each is related to our outcome variables. We find that the counterintuitive relations we document in the primary analysis are attributable to the optimal cash level, whereas the suboptimal component of the cash holdings generally behaves as predicted by the "immediate cash needs" hypothesis.

Taken together, our results suggest that after controlling for expected cash flows, existing cash holdings are not associated with the equity issue policies in the manner predicted by the "immediate cash needs" hypothesis. The results of additional analysis imply that the absence of predicted relations is driven by a company's target cash considerations.

Although our findings may seem counterintuitive at first glance, they are consistent with several studies showing that cash-rich companies prefer equity over cash in various corporate transactions such as compensating employees (Bergman and Jenter, 2007) and financing mergers and acquisitions (M&As) (Pinkowitz, Sturgess, and Williamson, 2013). Our results are also in line with Acharya, Davydenko and Strebulaev (2012), who document that, by contrast to common intuition that firms with larger cash holdings are 'safer', larger cash holdings are actually associated with higher levels of credit risk. Together with the results of these studies, our findings suggest that a reconsideration of the framework for corporate cash reserves as a source of corporate liquidity may be warranted.

Our study makes the following contributions to the literature. DeAngelo, DeAngelo and Stulz (2010) provide initial evidence on the importance of cash shortfall for equity issue decisions, while Huang and Ritter (2021) investigate the effect of cash shortfall on external financing decisions in a more comprehensive manner. We push forward this line of research by disaggregating the cash shortfall measure into the exiting cash holdings and expected cash flow components and, using a regression approach, test how each of the components is related to equity issue policies.

Our results suggest that the cash holdings component of the cash shortfall does not behave as predicted by the "immediate cash needs" hypothesis and thus imply that measuring cash needs with expected cash flows may be better suited to capturing the cash needs. Considering the contribution more broadly, our investigation helps to assess the reasonableness of several assumptions made in the related literature with respect to the consequences of ample cash holdings. For example, in Myers and Majluf's (1984) framework, financial slack allows firms to avoid external financing, implying that cash-rich companies should be less likely to issue. In a similar vein, Faulkender and Wang (2006) build some of their hypotheses on a premise that companies with higher cash holdings are less likely to access capital markets in the near future. In a parallel stream of literature on financial constraints, the existing cash balance is considered an alternative source of internal funds together with cash inflows.[3] Under this view, cash-rich firms are perceived as relatively unconstrained (Kaplan and Zingales, 1997; Kaplan and Zingales, 2000; Almeida, Campello, and Weisbach, 2004). However, studies such as Fazzari, Hubbard, and Petersen (1988), Fazzari, Hubbard, and Petersen (2000), and Hadlock and Pierce (2010) suggest that firms with more cash are actually more likely to be constrained. Overall, there is a disagreement in the existing literature on whether or not cash-rich companies are willing to deplete their cash reserves and whether they experience higher costs in accessing external markets. Studying the implications of cash holdings for equity issues sheds more light on this debate.

The remainder of the paper is organized as follows. Section 2 presents the decomposition of cash shortfall into a "stock" component and a "flow" component and develops hypotheses. Section 3 describes our sample selection procedure. Section 4 reports the main empirical results. Section 5 provides analyses of alternative explanations for the main results, while Section 6 reports robustness tests. Section 7 concludes the paper.

2. Disaggregation of cash shortfall and hypotheses development

In this section, we lay out the definition of the cash shortfall measure, decompose it into "stock" and "flow" components and develop hypotheses regarding the relationship between each of the components and equity issue policies. Prior research has adopted several approaches to the measurement of a firm's immediate cash needs. Early empirical research has focused primarily on the "flow" component. This component, also known as "financial deficit", is defined using the following cash flow statement identity:

$$DEFICIT = DIV_t + INVESTMENT_t + \Delta WC_t - ICF_t = \Delta D_t + \Delta E_t \tag{1}$$

where DIV_t = cash dividends; $INVESTMENT_t$ = net investments, including capital expenditures and acquisitions; ΔWC_t = net increase in working capital; ICF_t = internal operating cash flows after tax and interest; ΔD_t = net cash proceeds from debt issues; ΔE_t = net cash proceeds from equity issues.

The measure of financial deficit, first introduced by Shyam-Sunder and Myers (1999) and subsequently employed by Frank and Goyal (2003), Kayhan and Titman (2007), Lemmon and Zender (2010) and Bharath, Pasquariello, and Wu (2009), among others, is supposed to capture the cash needed to carry out operating activities and undertake investments.[4] Eq. (1) also implies that the imbalances in cash flows from operating and investing activities must be covered with cash proceeds from the issuance of external capital. Hence, due to the cash flow statement identity, *DEFICIT* can equivalently be viewed as net external funds raised.[5, 6]

[3] Financial constraints can be defined as a wedge between a firm's opportunity cost of internal capital and its cost of external capital (e.g., Farre-Mensa and Ljungqvist, 2015). This stream of literature investigates differences in companies' behavior facing different levels of financial constraints, thereby focusing on companies' actions undertaken to minimize the cost of external financing.

[4] Eq. (1) presents definition of DEFICIT following Frank and Goyal (2003).

[5] Some tests of capital structure theories employ a broader definition of deficit, which focuses on the financing side of the deficit identity and encompasses non-cash transactions, such as equity grants to employees or equity-financed acquisitions (e.g., Fama and French, 2005).

[6] The literature, which employs the *DEFICIT* measure, usually focuses on the corporate financing choice, i.e., the choice between raising debt or equity. Because this choice is not the focus of our discussion, we lump together the sources of external capital in explaining the cash need measures.

More recent studies add the "stock" component, i.e., existing cash holdings, to the measure of cash needs. DeAngelo, DeAngelo, and Stulz (2010, p. 287) note that "a firm with large current funds flow deficit and ample cash balances has no immediate need to raise outside capital". To evaluate the importance of issue proceeds for a firm's operating and financing policies, DeAngelo, DeAngelo, and Stulz (2010) calculate "pro forma" cash-to-asset ratio of issuing firms in the year after a seasoned equity offering (SEO) under an assumption that the firms did not receive the offer proceeds, but otherwise maintained all other non-SEO investment and financial decisions. Hence, the superiority of the cash shortfall measure over the *DEFICIT* stems from taking into account existing cash balances to gauge the extent to which a firm truly requires outside funds.

Huang and Ritter (2021) follow DeAngelo, DeAngelo, and Stulz (2010) to identify firms that are running out of cash by calculating the year-end hypothetical cash balance under the assumption of no external financing. Specifically, they define realized cash shortfall as:

$$CASH\ EX\ POST = CASH_{t-1} + NET\ CASH\ FLOW_t \tag{2}$$

where:

$CASH_{t-1}$ is the cash holdings at the beginning of the year;

$$NET\ CASH\ FLOW_t = ICF_t - INVESTMENT_t - \Delta\ NON\text{-}CASH\ WC_t - DIV_t, \tag{2a}$$

or, equivalently:

$$NET\ CASH\ FLOW_t = \Delta CASH_t - \Delta D_t - \Delta E_t. \tag{2b}$$

Note, that the *NET CASH FLOW* is a close counterpart of the *DEFICIT* measure described above. As demonstrated in Equations (1), (2a) and (2b), the only difference between *DEFICIT* and *NET CASH FLOW* stems from the treatment of cash change. Specifically, it is usually included in the *DEFICIT* as a part of the change in working capital, but is excluded from *NET CASH FLOW.*[7]

Eq. (2) demonstrates that the cash shortfall can be expressed as a function of pre-issue cash balance and net cash flows. Thus, if cash needs as measured by the cash shortfall are important in equity issue decisions, we expect both the flow component ($NET\ CASH\ FLOW_t$) and the stock components ($CASH_{t-1}$) of the cash shortfall to be associated with the equity issue probability.[8] Specifically, we form the following hypotheses:

Hypothesis 1a: Higher expected cash flows are associated with a lower likelihood of equity issue probability.

Hypothesis 1b: Higher existing cash holdings are associated with lower equity issue probability.

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[7] However, depending on the purposes of analysis, change in cash is sometimes backed out from the DEFICIT as well (e.g., Denis and McKeon, 2012).

[8] In the main regression analysis, Huang and Ritter (2021) employ a measure of cash depletion, defined as an indicator variable equal one if net cash outflows exceed beginning-of-year cash balance, zero otherwise, and as such, represents a transformation of the cash shortfall measure in Eq. (2).

The theory assumes that the "flow" component of the cash shortfall is exogenous in the sense that it is the cash need that drives the decision to raise external financing. Yet, one can argue that the more firms raise, the more they spend. In other words, firms raising extra equity capital, for example, because of favorable market conditions, may undertake certain investment projects that they would not otherwise have taken. Likewise, firms can omit, cut back or delay certain investment projects if the costs of raising external funds prevent them from capital issuance. Due to the cash flow identity, the sources of funds and the uses of funds are determined contemporaneously, which leads to the reverse causality problem and potentially introduces a bias into the relation between cash shortfall and equity issuance decisions. To mitigate this problem, in some of the empirical tests, we use lagged values of cash flows to approximate the expected cash flows.

Next, if issuers expect to match the issue proceeds to their cash shortfall, conditional on an issue, we expect these components of the cash shortfall to be inversely related to the size of the issue proceeds. Specifically:

Hypothesis 2a. Conditional on equity issue, higher expected cash flows are associated with lower equity issue proceeds.

Hypothesis 2b. Conditional on equity issue, higher existing cash balances are associated with lower equity issue proceeds.

3. Sample selection

We start our sample selection by obtaining annual financial data from Compustat and stock market data from the Center for Research in Security Prices (CRSP) for the period 1987 to 2014. The choice of the first year of our sample is motivated by the introduction in 1987 of the standardized format for reporting of cash flow statements (Statement of Financial Accounting Standards (SFAS) #95), which facilitates precise measurement of variables employing cash flow statement information. We lose the first and the last years of our sample due to the requirement of availability of lagged and one-year-ahead variables. To select equity issues, we apply the following screens. First, we exclude financial and utility companies (2-digit SIC codes 49 and 60-69), because they are subject to regulatory forces. Second, we remove observations with negative values of book equity and observations lacking the necessary information for our main empirical tests. Companies with negative book values are removed since those companies are in deep financial distress and their accounting numbers are not necessarily reflecting correctly going concern principles behind the financial reporting rules.

To identify equity issue years, we select firm-years in which cash proceeds from equity issues reported in cash flow statements exceed 5% of the beginning total assets. We remove observations where equity issue proceeds are small relative to total assets in order to reduce potential noise associated with cash inflows resulting from stock option exercises.[9] Applying these screens, we identify 13,033 equity issues during 1988-2013. Details of our sample selection procedure are presented in Table 1.

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[9] The 5% threshold was used, for example, in studies modeling likelihood of debt versus equity issues (e.g., Hovakimian, Opler, and Titman, 2001; Chang, Dasgupta, and Hilary, 2006; Leary and Roberts, 2010). Our subsequent results are also robust to identifying equity issuers as those whose issue proceeds exceed both 5% of beginning total assets and 3% of beginning market value (McKeon, 2015) and to identifying equity issuers using SDC Platinum database.

Table 1 Sample selection

All firm-year observations in Compustat over 1987–2014 with non-missing CRSP and Compustat identifiers	178,682
Less:	
Firms in financial and regulated utility industries (2-digit SIC-codes 49 and 60-69)	(60,136)
Negative values of shareholder's equity and missing values of variables used in the main empirical analysis *($LOGAT_{t-1}$, MB_{t-1}, RET_{t+1}, RET_{t-1}, $FIRM\_AGE_{t-1}$, $CASH\_STOCK_{t-1}$, $CASH\_FLOW_{t-1}$, $CASH\_FLOW_t$, EQ_ISS_t, DIF_CASH_t, OCF_t, $DEBT\_ISS_t$, $OTHER_t$)*	(35,043)
Sample of firms used in regressions modelling probability of an equity issue	**83,498**
Less:	
Observations where gross equity issue proceeds are less than 5% of beginning total assets	(70,465)
The final sample of equity issues	**13,033**

Notes: The table illustrates our sample selection procedure.

Along with the information on equity issue and cash shortfall, we retrieve information necessary to construct control variables in models of equity issue probability, equity issue size and cash savings. Definitions of all variables are presented in Appendix A. We winsorize all continuous variables at the top and bottom 1% levels to mitigate the impact of outliers.

Table 2 reports summary statistics of all variables used in the empirical analysis both in the full sample, which includes both equity issuers and non-issuers (Panel A) and the sample limited exclusively to equity issuers (Panel B).

Table 2 Summary statistics of variables used in the empirical analysis

PANEL A: FULL SAMPLE								
Variable	N	Mean	Min	Q1	Median	Q3	Max	Std Dev
EQ_ISS_t	83,498	0.07	0.00	0.00	0.00	0.02	1.50	0.22
RET_{t+1}	83,498	0.05	-0.94	-0.34	-0.06	0.24	3.34	0.67
RET_{t-1}	83,498	0.06	-0.92	-0.33	-0.06	0.25	3.45	0.68
MB_{t-1}	83,498	3.15	0.30	1.20	1.99	3.46	26.69	3.84
$LOGAT_{t-1}$	83,498	5.46	1.47	3.89	5.30	6.87	10.81	2.10
$CASH\_FLOW_{t-1}$	83,498	-0.07	-1.51	-0.11	-0.01	0.05	0.35	0.27
$CASH\_FLOW_t$	83,498	-0.06	-1.32	-0.10	0.00	0.06	0.34	0.24
$CASH\_STOCK_{t-1}$	83,498	0.19	0.00	0.03	0.10	0.27	0.91	0.22
$FIRM\_AGE_{t-1}$	83,498	12.89	2.00	7.00	13.00	20.00	20.00	6.18
OCF_t	83,498	0.05	-0.77	0.01	0.08	0.14	0.43	0.18
OCF_{t-1}	83,498	0.05	-0.79	0.01	0.08	0.15	0.45	0.18
$INVCF_t$	83,498	-0.10	-1.07	-0.14	-0.06	-0.02	0.35	0.19
$DVCF_t$	83,498	0.01	0.00	0.00	0.00	0.01	0.13	0.02
$INVCF_{t-1}$	83,498	-0.12	-1.22	-0.15	-0.07	-0.02	0.34	0.21
$DVCF_{t-1}$	83,498	0.01	0.00	0.00	0.00	0.01	0.13	0.02

PANEL B: SAMPLE OF EQUITY ISSUERS								
Variable	N	Mean	Min	Q1	Median	Q3	Max	Std Dev
EQ_ISS_t	13,033	0.45	0.05	0.09	0.21	0.52	4.00	0.66
RET_{t+1}	13,033	-0.05	-1.04	-0.51	-0.20	0.17	3.91	0.77
RET_{t-1}	13,033	0.33	-0.97	-0.35	0.04	0.56	6.34	1.17
MB_{t-1}	13,033	6.31	0.45	1.98	3.52	6.68	62.23	8.94
$LOGAT_{t-1}$	13,033	4.31	1.13	2.89	4.10	5.53	9.18	1.85
$CASH\_FLOW_{t-1}$	13,033	-0.26	-2.62	-0.37	-0.11	0.01	0.38	0.47
$CASH\_FLOW_t$	13,033	-0.35	-3.02	-0.49	-0.19	-0.03	0.37	0.55
$CASH\_STOCK_{t-1}$	13,033	0.29	0.00	0.05	0.20	0.48	0.96	0.28
$FIRM\_AGE_{t-1}$	13,033	9.85	2.00	5.00	8.00	14.00	20.00	5.50
DIF_CASH_t	13,033	0.21	-0.47	-0.01	0.05	0.26	2.97	0.50
$DEBT\_ISS_t$	13,033	0.15	0.00	0.00	0.00	0.12	2.10	0.34
OCF_t	13,033	-0.10	-1.63	-0.25	0.00	0.13	0.55	0.37
$OTHER_t$	13,033	0.05	0.00	0.00	0.00	0.01	1.16	0.18
$INVCF_t$	13,033	-0.25	-2.49	-0.32	-0.12	-0.03	0.44	0.43
$DVCF_t$	13,033	0.01	0.00	0.00	0.00	0.00	0.11	0.02
OCF_{t-1}	13,033	-0.09	-1.58	-0.23	0.00	0.12	0.53	0.35
$INVCF_{t-1}$	13,033	-0.16	-1.82	-0.22	-0.08	-0.01	0.50	0.33
DVCF_{t-1}	13,033	0.00	0.00	0.00	0.00	0.00	0.11	0.02
RD_t	12,466	1.95	0.00	0.00	0.05	0.23	76.03	9.28
$\mathrm{INDSIGMA}_t$	13,024	0.15	0.04	0.11	0.14	0.18	0.26	0.05

Notes: The table displays summary statistics of variables used in the empirical analysis. Panel A contains summary statistics of variables in the sample, which includes both equity issuers and non-issuers, while Panel B reports summary statistics of variables in the sample of equity issuers. All of the variables are defined in Appendix A.

As reported in Panel B, equity issuers experience a stock price run-up in the year preceding the equity issue and negative stock returns in the year following the issue– a pattern consistent with Loughran and Ritter (1995). Additionally, a median issuer is 8 years old and experiences negative cash flows in both the year of issue and the preceding year ($CASH\_FLOW_t$ = -0.19 and $CASH\_FLOW_{t-1}$ = -0.11). Comparison of mean and median values in panels A and B reveal further differences between issuers and non-issuers. Specifically, issuers as smaller, younger and have better investment opportunities, as captured by the values of $LOGAT_{t-1}$, $FIRM\_AGE_{t-1}$ and MB_{t-1}, respectively. Importantly, equity issuers experience more negative cash flows, yet hold larger cash balances (mean $CASH\_STOCK_{t-1}$ = 0.29 in Panel B) relative to the full sample of issuers and non-issuers (mean $CASH\_STOCK_{t-1}$ = 0.19 in Panel A).

4. Empirical specification and main multivariate results

4.1 Probability of equity issue

To test Hypothesis 1a and Hypothesis 1b, we follow the approach of DeAngelo, DeAngelo, and Stulz (2010) and estimate the probability of an equity issue as a function of market-to-book ratio, market-adjusted stock returns over prior and subsequent years, and the numbers of years listed. We further augment this baseline model with components of cash shortfall, namely, beginning-of-year cash-to-asset ratio and cash flows as defined in Eq. (2). Unlike DeAngelo, DeAngelo, and Stulz (2010), who include past and future 36-month market-adjusted stock returns, we use one-year-lagged and one-year-ahead market-adjusted returns in order to minimize loss of observations and control for firm size using a natural logarithm of total assets at the beginning of the equity issue year. Specifically, we estimate the following logit regression:

$$Prob(EQ\ ISS=1)_t = \beta_0 + \beta_1 LOGAT_{t-1} + \beta_2 MB_{t-1} + \beta_3 RET_{t+1} + \beta_4 RET_{t-1} + \beta_5 FIRM\_AGE_{t-1} + \beta_6 CASH\_STOCK_{t-1} + \beta_7 CASH\_FLOW_t + INDUSTRY + YEAR \quad (3)$$

where the dependent variable takes a value of one if the gross equity issue constitutes more than 5% of the beginning total assets, and zero otherwise. The right-hand side variables are defined in Appendix A. The model includes yearly and industry fixed effects, and the standard errors are double-clustered by firm and year.

Table 3 Results of logit regression of equity issue probability

	(1)	(2)	(3)	(4)
MB_{t-1}	0.094 (0.00)	0.102 (0.00)	0.095 (0.00)	0.101 (0.00)
$LOGAT_{t-1}$	-0.203 (0.00)	-0.269 (0.00)	-0.179 (0.00)	-0.203 (0.00)
RET_{t+1}	-0.155 (0.00)	-0.206 (0.00)	-0.148 (0.00)	-0.204 (0.00)
RET_{t-1}	0.225 (0.00)	0.265 (0.00)	0.241 (0.00)	0.341 (0.00)
$FIRM\_AGE_{t-1}$	-0.056 (0.00)	-0.060 (0.00)	-0.053 (0.00)	-0.058 (0.00)
$CASH\_STOCK_{t-1}$	-0.119 (0.65)	0.281 (0.34)	-0.242 (0.33)	0.086 (0.69)
$CASH\_FLOW_{t}$	-3.307 (0.00)			
$CASH\_FLOW_{t-1}$		-1.062 (0.00)		
OCF_{t}			-3.874 (0.00)	
$INVCF_{t}$			-3.430 (0.00)	
$DVCF_{t}$			-0.046 (0.99)	
OCF_{t-1}				-2.254 (0.00)
$INVCF_{t-1}$				-0.540 (0.03)
$DVCF_{t-1}$				-3.921 (0.23)
Pseudo *R*-squared	0.2712	0.2070	0.2754	0.2174
Number of observations	83,498	83,498	83,498	83,498

Notes: This table shows the results of a logit regression modeling a probability of equity issue following DeAngelo, DeAngelo, and Stulz (2010). Coefficients on intercept and indicator variables for year and industry are not shown. Standard errors are clustered by firm and year. The numbers reported in parentheses are p-values. All variables are defined in Appendix A.

The results of estimating Eq. (3) are reported in Table 3. The first column shows the regression results with cash shortfall decomposed into pre-issue cash balance and concurrent cash flows. In this specification, we find a negative relation between the "flow" component ($CASH\_FLOW_t$) and the probability of issue and an insignificant relation between the "stock" ($CASH\_STOCK_{t-1}$) component and the probability of issue. In column 2 of Table 3, we use cash flows lagged by one year as a proxy for the expected "flow" component ($CASH\_FLOW_{t-1}$) of the cash shortfall to address a potential simultaneity between equity issue decision and the concurrent cash flows. We further address this potential problem in the robustness check section by replacing cash flow variable with lagged earnings, dividends and depreciation and amortization variables. In this specification, while the expected flow component remains a significant predictor of equity issue, the estimated coefficient on $CASH\_STOCK_{t-1}$ is again not statistically different from zero. When it comes to other control variables, their sign and magnitude are in line with those reported in DeAngelo, DeAngelo, and Stulz (2010). Specifically, market-to-book ratio and past stock returns are positively related to the probability of equity issue, while firm size, future stock returns and firm age are negatively related to the probability of equity issue. We further address a potential simultaneity between equity issue decision and the concurrent cash flows in the robustness check section by replacing the cash flow variable with lagged earnings, dividends, and depreciation & amortization variables.

In columns 3 and 4 of Table 3, we further disaggregate cash flows into components, namely operating cash flows, investing cash flows and cash dividends, in order to find out whether the coefficient on $CASH\_STOCK_{t-1}$ is affected by alternative definitions of expected cash flows. Column 3 shows the results of estimating this specification with $CASH\_FLOW_t$ further decomposed into cash flows from operating activities (OCF_t), cash flows from investing activities ($INVCF_t$) and cash dividend payments ($DVCF_t$).[10] Column 4 reports the results of the regression, in which lagged cash flows ($CASH\_FLOW_{t-1}$) are disaggregated accordingly. The results show that operating and investing cash flows (OCF_t and $INVCF_t$ in column 3 and OCF_{t-1} and $INVCF_{t-1}$ in column 4) are inversely related to the probability of an equity issue. The coefficient on the cash dividend component is insignificant in both columns, which may be related to the fact that dividend payment status itself captures lifecycle considerations or financial constraints (DeAngelo, DeAngelo, and Stulz, 2010; Fazzari, Hubbard, and Petersen, 1988). Similar to the results reported in the first two columns, the coefficient on pre-issue cash balance ($CASH\_STOCK_{t-1}$) is not statistically different from zero.

Taken together, the results reported in Table 3 suggest that after having controlled for alternative proxies of expected cash flows and other determinants of equity issues, the cash balance component of the cash shortfall does not have a predictive ability for equity issue likelihood.

4.2 Equity issue size

We next turn to an investigation of the relationship between components of cash shortfall and equity issue size. Specifically, using only equity issue observations, we test Hypothesis 2a and Hypothesis 2b by estimating the following OLS regression model:

$$EQ\_ISS_t = \beta_0 + \beta_1 LOGAT_{t-1} + \beta_2 MB_{t-1} + \beta_3 RET_{t+1} + \beta_4 RET_{t-1} + \beta_5 FIRM\_AGE_{t-1} + \beta_6 CASH\_STOCK_{t-1} + \beta_7 CASH\_FLOW + IND + YEAR \quad (4)$$

where the dependent variable is equal to equity issue proceeds deflated by the beginning total assets. The right-hand-side variables are defined in Appendix A. The model includes yearly and industry fixed effects, and standard errors are clustered by firm.

When estimating Eq. (4), we include the same set of control variables as in the logit regression of equity issue probability (Eq. (3)), because the size of equity issue is likely to be determined by similar factors as equity issue decisions. For example, equity issue size can reflect

[10] The cash flow from operating activities corresponds to the sum of internal cash flows (ICF_t) and changes in working capital ($\Delta NON\text{-}CASH\ WC_t$) discussed in Section 2.

timing behavior, because firms are better off issuing a larger amount when the market conditions are favorable (e.g., Chang, Dasgupta, and Hilary, 2006). Stock returns surrounding the equity issue years and market-to-book ratios are suitable candidates to control for market timing motives (Loughran and Ritter, 1995; Loughran and Ritter, 1997; Baker and Wurgler, 2002). Further, companies facing higher issue costs are likely to make larger equity issues. Therefore, smaller firms, whose issue costs are higher in relative amounts, should have stronger incentives to make larger issues, implying an inverse relation between firm size and the amount of equity issue proceeds.

Table 4 Results of OLS regression of equity issue size

	(1)	(2)	(3)	(4)
MB_{t-1}	0.004 (0.00)	0.012 (0.00)	0.004 (0.00)	0.010 (0.00)
$LOGAT_{t-1}$	-0.039 (0.00)	-0.091 (0.00)	-0.036 (0.00)	-0.069 (0.00)
RET_{t+1}	-0.005 (0.29)	-0.033 (0.00)	-0.005 (0.38)	-0.032 (0.00)
RET_{t-1}	0.022 (0.00)	0.036 (0.00)	0.026 (0.00)	0.054 (0.00)
$FIRM\_AGE_{t-1}$	0.000 (0.82)	-0.003 (0.00)	0.000 (0.78)	-0.004 (0.00)
$CASH\_STOCK_{t-1}$	0.061 (0.01)	0.284 (0.00)	0.043 (0.05)	0.233 (0.00)
$CASH\_FLOW_t$	-0.800 (0.00)			
$CASH\_FLOW_{t-1}$		-0.165 (0.00)		
OCF_t			-0.854 (0.00)	
$INVCF_t$			-0.777 (0.00)	
$DVCF_t$			1.125 (0.00)	
OCF_{t-1}				-0.417 (0.00)
$INVCF_{t-1}$				0.020 (0.31)
$DVCF_{t-1}$				0.902 (0.00)
Adj. *R*-squared	0.5832	0.2474	0.5749	0.2662
Number of observations	13,033	13,033	13,033	13,033

Notes: This table reports the results of an OLS regression modeling size of equity issue proceeds. The dependent variable is proceeds from equity issues scaled by lagged total assets. The sample used includes only firms with equity issues in excess of 5% of lagged total assets. Coefficients on intercept and indicator variables for year and industry are not reported. Standard errors are clustered at the firm level. The numbers reported in parentheses are p-values. All variables are defined in Appendix A.

The results of estimating Eq. (4) are presented in Table 4. The table follows the same logic as Table 3, i.e., the first column contains concurrent cash flows, the second column contains lagged cash flows, and in the last two columns, these cash flow measures are decomposed into cash flow from operating activities, cash flow from investing activities and cash dividend payments.

Similar to the results reported in Table 3, the results reported in Table 4 show that cash flows, either lagged or current, are significantly negatively associated with the size of equity issue proceeds. In turn, the size of equity issue proceeds actually increases with the beginning cash balance, as indicated by the positive coefficients on $CASH\_STOCK_t$ varying from 0.043 to 0.284, opposite to the "immediate cash needs" hypothesis. Other results indicate that lagged investment is a poor predictor of future cash needs, as $INVCF_{t-1}$ in column 4 is not statistically significant. Overall, this analysis implies that cash-rich issuers do not behave as if they take into account their existing cash holdings in planning their equity issues.

5. Alternative explanations and additional analysis

The analysis so far indicates that companies do not act in their equity issue policies as if they consider their existing cash balances as a source of liquidity. To further understand what drives these results, we perform several additional analyses. First, we investigate whether pre-issue cash holdings of equity issuers are related to retention patterns of their equity proceeds in the year of or years after the issue. In the second set of tests, we investigate whether optimal cash considerations explain our main findings.

5.1 Cash needs and cash savings of equity issuers

If issuers consider their existing cash balances in planning their investment policies, one would expect issuers with higher pre-issue cash holdings to dissipate the issue proceeds at a faster rate relative to issuers with lower pre-issue cash holdings. Evidence of the substantial cash expenditures of issue proceeds would thus explain a positive association between pre-issue cash holdings and the amount of issue proceeds. To address this question, we estimate an issuance-saving regression model of McLean (2011) augmented with an interaction between equity issue proceeds and pre-issue cash balance:

$$DIF\_CASH_t = \beta_0 + \beta_1 EQ\_ISS_t + \beta_2 CASH\_STOCK_{t-1} + \beta_3 EQ\_ISS_t \times CASH\_STOCK_{t-1} + \beta_4 OCF_t + \beta_5 DEBT\_ISS_t + \beta_6 OTHER_t + \beta_7 LOGAT_{t-1} + IND + YEAR \tag{5}$$

The variables from Eq. (5) are defined in Appendix A. When estimating this model, we limit our sample to equity issue years with t denoting the year of issue.

Table 5 Results of estimating equity issuance-cash savings relation

	(1)	(2)	(3)	(4)	(5)
EQ_ISS_t	0.607 (0.00)	0.626 (0.00)	0.604 (0.00)	0.481 (0.00)	0.507 (0.00)
$CASH\_STOCK_{t-1}$	-0.099 (0.00)	-0.095 (0.00)	-0.061 (0.00)	-0.070 (0.00)	-0.036 (0.08)
EQ_ISS_t * $CASH\_STOCK_{t-1}$	0.227 (0.00)	0.210 (0.00)	0.189 (0.00)	0.174 (0.00)	0.133 (0.00)
OCF_t	0.555 (0.00)	0.562 (0.00)	0.542 (0.00)	0.558 (0.00)	0.551 (0.00)
$DEBT\_ISS_t$	0.087 (0.00)	0.093 (0.00)	0.080 (0.00)	0.090 (0.00)	0.090 (0.00)
$OTHER_t$	0.050 (0.03)	0.046 (0.04)	0.043 (0.05)	0.050 (0.02)	0.039 (0.08)
$LOGAT_{t-1}$	-0.011 (0.00)	-0.009 (0.00)	-0.010 (0.00)	-0.011 (0.00)	-0.009 (0.00)
$DVCF_t$		-0.287 (0.26)			-0.218 (0.41)
EQ_ISS_t * $DVCF_t$		-3.066 (0.00)			-3.283 (0.00)
RD_t			-0.002 (0.00)		-0.002 (0.00)
EQ_ISS_t * RD_t			0.002 (0.00)		0.001 (0.01)
$INDSIGMA_t$				-0.085 (0.56)	0.103 (0.49)
EQ_ISS_t * $INDSIGMA_t$				0.948 (0.00)	0.877 (0.00)
Adj. *R*-squared	0.6864	0.6906	0.6699	0.6896	0.6774
Number of observations	13,033	13,033	12,466	13,024	12,457

Notes: This table reports the results of an OLS regression modeling the cash saving rates of equity issuers. The dependent variable is the difference in cash during the year scaled by lagged total assets. The sample only includes firms with equity issues in excess of 5% of lagged total assets. Coefficients on intercept and indicator variables for year and industry are not reported. Standard errors are clustered at the firm level. The numbers reported in parentheses are p-values. All variables are defined in Appendix A.

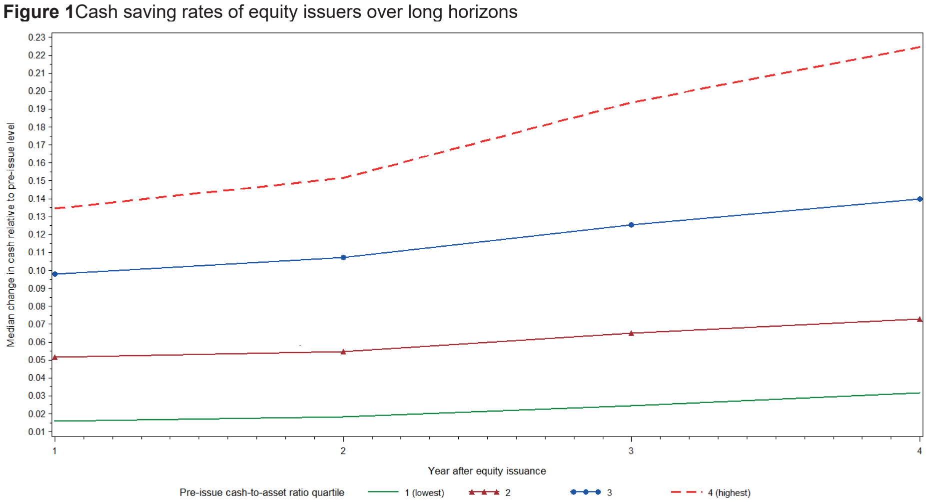
The results of estimating Eq. (5) are reported in Table 5. The results reported in column 1 show that cash-rich issuers tend to retain more cash from issue proceeds (the coefficient on EQ_ISS_t*-$CASH\_STOCK_{t-1}$ = 0.227, p-value<0.00). This finding does not support the notion that existing cash balance is considered by the equity issuers in spending of their equity issue proceeds. McLean (2011) argues that saving issue proceeds reflects precautionary motives and provides evidence that post-issue cash savings rates vary cross-sectionally with proxies for precautionary motives. One concern with our findings is that the pre-issue cash balance in itself can capture some dimension of precautionary considerations. For example, as argued by Fazzari, Hubbard, and Petersen (2000), the more financially constrained a firm is, the greater its incentive to accumulate cash. To address this concern, we augment Eq. (5) with proxies for precautionary motives as advocated by McLean (2011). Specifically, we interact EQ_ISS_t with dividend payments, R&D expenditures and industry cash flow variance.[11] The results of these specifications are reported in columns 2-5 of Table 5. The results show that cash-rich companies tend to retain more equity issue proceeds even after controlling for the precautionary motives for cash savings identified by McLean (2011).

With respect to interaction variables, the direction of coefficients on interaction variables capturing precautionary motives is similar to the one reported in McLean (2011). We note that the magnitude of some coefficients is different because we focus on economically significant equity issues, whereas McLean's sample includes all firm-years available in Compustat and, as such, may contain noise related to passive equity issues associated with the exercise of stock options.

A potential explanation for the higher rates of cash retention of cash-rich firms is that these companies may need more cash to finance their anticipated expenditures in the years subsequent to the issue. These planned investment outlays may explain the issue decisions of cash-rich companies. To investigate this possibility, we first examine the time trends in the cash-saving patterns of equity issuers by grouping the equity issuers into quartiles according to their pre-issue cash-to-asset ratios and tracking the evolution of changes in cash in each of these groups over the next four years. We deflate the cash change each year by the total assets in the pre-issue year. If cash-rich issuers use their cash reserves in the years following the issue, one would expect to observe sharper reversals of cash increases in companies with the highest pre-issue cash ratios over time.

Figure 1 plots median changes in cash deflated by pre-issue total assets in years 1 through 4 after the equity issue year for groups of companies sorted by pre-issue cash-to-asset ratios.

Figure 1 Cash saving rates of equity issuers over long horizons



Notes: The figure shows the median cumulative change in cash over the course of four years following equity issues relative to pre-issue cash deflated by pre-issue total assets in companies grouped by a pre-issue cash-to-asset ratio. Each year, we compute the change in cash as (Casht – Cash0)/Assets0 for t=1, 2, 3, 4. Equity is issued in year 1.

[11] While McLean (2011) measures R&D expenditures and dividend variables as continuous variables, one concern with this measurement approach is that these variables are themselves outcomes of the accounting system and hence may capture the effect of associated cash flows instead of proxying for precautionary motives. To partially address these concerns, we alternatively measure R&D expenditures and dividend payments as indicator variables equal to one, if the corresponding amount is greater than zero, and zero otherwise. Our results are unaffected by this modification.

Figure 1 is not consistent with the argument that cash-rich firms deplete their cash reserves in the long run. In fact, the figure shows that cash savings of the cash-richest firms also continue to increase more dramatically after the equity issue year relative to issuers holding less cash. For example, a change in cash reserves of equity issuers in the upper quartile of pre-issue cash-to-asset ratio grows from approximately 14% to 22% of the pre-issue asset level between the first and the fourth year after the issue. The corresponding difference is virtually non-existent for the issuers in the lowest quartile of the pre-issue cash-to-asset ratio.

To further investigate this question in a multivariate setting, we follow Kim and Weisbach (2008) and estimate the issuance-saving regression (Eq. (5)) using change in cash over a 2-, 3-, and 4-year horizon following the equity issue year. In this specification, we accumulate other flow variables from the right-hand side of Eq. (5) (equity issue proceeds, debt issue proceeds, operating cash flows, and other cash flows) over the same time windows to correspond to the change in cash. *CASH_STOCK* and *LOGAT* are measured at the pre-issue level and denoted with the subscript 0. The results are presented in Table 6.

Table 6 Cash savings of equity issuers over long horizons

	(1) T=2	(2) T=3	(3) T=4
EQ_ISS_t	0.504 (0.00)	0.422 (0.00)	0.388 (0.00)
$CASH\_STOCK_0$	-0.222 (0.00)	-0.335 (0.00)	-0.365 (0.00)
$EQ\_ISS_t * CASH\_STOCK_0$	0.220 (0.00)	0.235 (0.00)	0.175 (0.00)
OCF_t	0.430 (0.00)	0.366 (0.00)	0.301 (0.00)
$DEBT\_ISS_t$	0.032 (0.04)	0.009 (0.56)	-0.005 (0.74)
$OTHER_t$	0.049 (0.01)	0.088 (0.00)	0.090 (0.31)
$LOGAT_0$	-0.007 (0.04)	-0.011 (0.03)	-0.007 (0.31)
Adj. R-squared	0.6448	0.6059	0.5644
Number of observations	12,971	11,695	10,577

Notes: This table reports the results of an OLS regression modeling retention of equity issue proceeds of equity issuers over a 2-, 3- and 4-year period following issuance. The dependent variable is the change in cash relative to pre-issue cash level scaled by pre-issue total assets. The flow right-hand-side variables (EQ_ISS_t, OCF_t, $DEBT\_ISS_t$, $OTHER_t$) are aggregated over the same period as the dependent variable. Subscript *0* denotes pre-issue levels. Coefficients on intercept and indicator variables for year and industry are not reported. Standard errors are clustered at the firm level. The numbers reported in parentheses are *p*-values. All variables are defined in Appendix A.

Due to attrition, sample sizes vary by the length of the period over which we measure cash changes. Overall, the results reported in Table 6 suggest that cash increases continue to persist in cash-rich companies in the years following the issue as the interaction variable $EQ\_ISS_t * CASH\_STOCK_0$ is significantly positive in each of the three columns. This implies that such companies use equity issues as a part of their cash accumulation strategy.

5.2 Target cash levels

The literature on cash holdings determinants (see, e.g., Opler, Pinkowitz, Stulz, and Williamson, 1999; Bates, Kahle, and Stulz, 2009) posits that firms may choose to hold higher cash reserves because it serves as a buffer against adverse cash flow shocks (precautionary motive) and because it saves transaction costs (transaction motive). The downsides of higher cash holdings include a lower rate of return, tax disadvantages and agency costs of free cash flows, among others (Opler, Pinkowitz, Stulz, and Williamson, 1999).

Thus, rather than simply reflecting resources being freely available for operating and investment needs, a firm's existing cash balances may be a result of the firm's optimal choice determined by trading off the costs and benefits of cash holdings. Under this view, firms may be unwilling to deploy their existing cash holdings because such actions will result in a distortion of the trade-off and movement away from the target balance. Hence, a firm lacking cash for operations and investments may prefer to raise financing from external markets rather than spend its optimal cash. Conversely, the suboptimal portion of the observed cash levels should be more discretionary and, consequently, the relations predicted by the "immediate cash needs" hypothesis should hold primarily with respect to the suboptimal portion, as opposed to the optimal cash level.

To test for the possible differential relation between optimal and suboptimal portions of the observed cash levels and equity issue policies, we first estimate a model of optimal cash holdings following Opler, Pinkowitz, Stulz, and Williamson (1999) and Bates, Kahle, and Stulz (2009), described further in Appendix B. We next investigate how lagged residuals and lagged fitted values from this model (our estimates of suboptimal and target cash) are related to equity issue probability and size. The results of these tests are presented in Table 7 and Table 8.

Table 7 Relation between optimal and suboptimal cash and equity issue likelihood

	(1)	(2)	(3)	(4)
MB_{t-1}	0.094 (0.00)	0.098 (0.00)	0.097 (0.00)	0.105 (0.00)
$LOGAT_{t-1}$	-0.176 (0.00)	-0.194 (0.00)	-0.220 (0.00)	-0.262 (0.00)
RET_{t+1}	-0.163 (0.00)	-0.161 (0.00)	-0.218 (0.00)	-0.220 (0.00)
RET_{t-1}	0.213 (0.00)	0.217 (0.00)	0.263 (0.00)	0.274 (0.00)
$FIRM\_AGE_{t-1}$	-0.053 (0.00)	-0.057 (0.00)	-0.056 (0.00)	-0.062 (0.00)
$CASH\_STOCK\_OPT_{t-1}$	0.890 (0.07)		1.779 (0.00)	
$CASH\_STOCK\_SUBOPT_{t-1}$		-0.733 (0.00)		-0.552 (0.03)
$CASH\_FLOW_{t}$	-3.434 (0.00)	-3.539 (0.00)		
$CASH\_FLOW_{t-1}$			-1.182 (0.00)	-1.219 (0.00)
Pseudo *R*-squared	0.2602	0.2605	0.1985	0.1940
Number of observations	66,757	66,757	66,757	66,757

Notes: This table shows the results of a logit regression modeling probability of equity issue following DeAngelo, DeAngelo, and Stulz (2010). Coefficients on intercept and indicator variables for year and industry are not shown. Standard errors are clustered by firm and year. The numbers reported in parentheses are *p*-values. All variables are defined in Appendix A.

Table 8 Relation between optimal and suboptimal cash and equity issue size

	(1)	(2)	(3)	(4)
MB_{t-1}	0.006 (0.00)	0.007 (0.00)	0.013 (0.00)	0.015 (0.00)
$LOGAT_{t-1}$	-0.029 (0.00)	-0.035 (0.00)	-0.060 (0.00)	-0.079 (0.00)
RET_{t+1}	-0.013 (0.02)	-0.013 (0.02)	-0.041 (0.00)	-0.043 (0.00)
RET_{t-1}	0.018 (0.00)	0.020 (0.00)	0.032 (0.00)	0.037 (0.00)
$FIRM\_AGE_{t-1}$	0.000 (0.56)	0.000 (0.80)	-0.003 (0.00)	-0.004 (0.00)
$CASH\_STOCK\_OPT_{t-1}$	0.226 (0.00)		0.629 (0.00)	
$CASH\_STOCK\_SUBOPT_{t-1}$		-0.057 (0.06)		0.013 (0.76)
$CASH\_FLOW_{t}$	-0.759 (0.00)	-0.772 (0.00)		
$CASH\_FLOW_{t-1}$			-0.146 (0.00)	-0.164 (0.00)
Adj. *R*-squared	0.5834	0.5770	0.2595	0.2390
Number of observations	9,509	9,509	9,509	9,509

Notes: This table reports the results of an OLS regression modeling size of equity issue proceeds of equity issuers. The dependent variable is proceeds from equity issues scaled by lagged total assets. The sample includes only firms with equity issues in excess of 5% of lagged total assets. Coefficients on intercept and indicator variables for year and industry are not reported. Standard errors are clustered at the firm level. The numbers reported in parentheses are *p*-values. All variables are defined in Appendix A.

As reported in Table 7, the relations between the two portions of the total cash holdings and our outcome variables are of different signs. Specifically, Columns 2 and 4 of Table 7 show that the suboptimal portion of cash is significantly negatively related to equity issue probability, in line with the "immediate cash needs" hypothesis. Similarly, there is some evidence that the relationship between suboptimal cash level and equity issue size is also weakly negative (Table 8, Column 2). In turn, the positive relationship between total cash balance and equity issue size documented earlier is largely attributable to the "target" cash, i.e., the portion of cash predicted by the cost-and-benefit tradeoff. In summary, these results provide support for the "immediate cash needs" hypothesis with respect to the suboptimal portion of total cash holdings.

Our interpretation of these results is that certain characteristics affect a firm's preferences for target cash holdings, which, in turn, drive the relation between pre-issue observed cash holdings and equity issue policies. Taken together, the results reported in this section imply that firms do not view their existing cash reserves as an unrestricted liquidity cushion, but are affected by target cash considerations when planning their financing policies.

6. Robustness tests

6.1 Alternative empirical proxies

To assess the robustness of our results, we employ several alternative definitions of the primary variables used in our regression analysis. First, we replicate our tests using net instead of gross equity and debt issues. That is, we subtract equity repurchases from equity issues and debt repurchases from debt issues to construct our *EQ_ISS* and *DEBT_ISS* measures. Second, we define *CASH_STOCK* using total assets net of cash as a deflator. Third, we rerun our empirical tests using a cash richness indicator variable, which we set equal to one if lagged cash-to-asset ratio exceeds our sample median, and to zero otherwise. Fourth, to alleviate a potential spurious correlation between lagged cash and our dependent variables, we use a twice-lagged cash-to-asset ratio in place of a lagged cash-to-asset ratio in our empirical tests (e.g., Almeida, Campello, and Weisbach, 2004). Fifth, to further tackle the potential simultaneity between the equity issue decision and the concurrent cash flows, we replace cash flow variables with lagged earnings, dividends and depreciation and amortization variables. Based on the findings of Barth, Cram and Nelson (2001) accounting earnings is a good proxy for future operating cash flows. Since it can be assumed that the dividend cut is costly, the dividend is a good proxy for the desired level of future dividends. Moreover, depreciation and amortization can be viewed as a good proxy for investment to maintain existing assets in place. Our main empirical results remain robust to these alternative specifications.

6.2 Alternative samples

Next, we re-estimate all of our empirical tests employing an alternative sample of equity issues from the SDC Platinum database. To construct the sample, we pull all U.S. non-IPO common stock issue transactions and exclude pure secondary share offerings, because in such offerings, proceeds do not flow to the firm, but rather, to existing shareholders. Whenever companies make several issues during the fiscal year, we add up the proceeds from all of these offerings so that the unit of observation corresponds to a firm-year. The final SDC sample with necessary financial information contains 4,023 equity issues that occurred during 1988-2013. Similar to the results of our primary empirical tests, we find that $CASH\_STOCK_{t-1}$ is unrelated to equity issue probability and significantly positively related to the size of equity issues. We also find that companies with higher pre-issue cash-to-asset ratios tend to retain a larger portion of equity issue proceeds as cash rather than spend them immediately.

7. Conclusions

Even though equity offerings is one of the most researched topics in corporate finance, we still do not fully understand why firms issue equity. According to one theory, firms issue equity primarily to finance their immediate cash needs. While some studies support this view, existing empirical evidence is not fully conclusive.

The purpose of our study is to shed more light on the "immediate cash needs" motive for equity issues by studying the association between the cash shortfall components and equity issue policies. Our primary results, estimated using a sample of U.S. public companies over the period 1987-2014, can be summarized as follows. First, we find that the existing cash reserves do not predict the incidence of equity issues. Rather, the impact of cash shortfall on equity issue likelihood comes through the expected cash flow component of cash shortfall. Second, our empirical evidence indicates that cash-richer firms tend to raise larger amounts of equity and retain a greater portion of the equity proceeds as cash. Taken together, these findings imply that firms do not consider their cash balances in their equity issue policies, and thus existing cash balance is not a reliable indicator of immediate cash needs. The results of our additional analysis are most consistent with the view that companies prefer to sit on cash because of target cash level considerations, thereby offering a more nuanced perspective on cash shortfall as a reason for equity issues.

While the immediate cash needs represent a straightforward and intuitive reason for equity issues, the relation between cash needs and equity issue policies is inherently difficult to test empirically due to a potential reverse causality problem. For example, one can argue that firms raising extra capital may undertake certain investment projects that they would not otherwise have taken. Likewise, firms can omit, cut back or delay certain investment projects if the costs of raising external funds prevent them from capital issuance. Although we have attempted to address this reverse causality problem by making use of lagged values in the construction of our empirical measures, we cannot fully rule out the possibility that our results and conclusions are unaffected by the reverse causality problem. One fruitful avenue for future research in equity issues is to identify settings where companies face external pressure to undertake investments and test whether companies with cash needs react to such pressures by raising capital.

Appendix A. Variable definitions

VARIABLE	DEFINITION	COMPUSTAT DATA ITEM FORMULA
EQ_ISS	Equity issue proceeds deflated by beginning-of-period total assets. This variable is set equal to 0 for values below 5%.	SSTK/lag(AT)
CASH_STOCK	Cash-to-asset ratio	CHE/AT
CASH_FLOW	The sum of operating and investing cash flows less cash dividends divided by beginning-of-period total assets as defined in Eq. (2a).	(OANCF + IVNCF – DV)/lag(AT)
MB	Market-to-book ratio	(PRCC*CSHO)/CEQ
LOGAT	Natural logarithm of total assets expressed in terms of purchasing power in 1999	ln(AT/CPI)
FIRM_AGE	Number of years the firm appears on Compustat, winsorized at 20 years	
DIF_CASH	Change in cash to beginning-of-period total assets	(CHE-lag(CHE))/lag(AT)
OCF	Operating cash flows deflated by beginning-of-period total assets	OANCF/lag(AT)
OTHER	Other cash flows deflated by beginning-of-period total assets	(SPPE+SIV+FSRCO)/lag(AT)
DEBT_ISS	Debt issue proceeds deflated by beginning-of-period total assets	DLTIS/lag(AT)
RET	Annual stock returns from CRSP less returns on CRSP value-weighted index over the same period	
INVCF	Investing cash flows deflated by beginning-of-period total assets	IVNCF/lag(AT)
DVCF	Cash dividends deflated by beginning-of-period total assets	DV/lag(AT)
RD	R&D expense deflated by total sales. Set equal to zero if R&D expense is missing.	max(0,XRD)/SALE
INDSIGMA	The average standard deviation of cash flows within each firm's 2-digit SIC code over the past 10 years with at least 5 years of available data. We disregard industries with fewer than 5 companies.	(OIBDP-XINT-TXT-DVC)/AT
CASH_STOCK_OPT	The predicted value of cash-to-asset ratio from the regression model described in Appendix B	
CASH_STOCK_SUBOPT	The residual value of cash-to-asset ratio from the regression model described in Appendix B	

Appendix B. Model of optimal cash

To estimate optimal and suboptimal levels of cash, we employ the model of cash determinants from Opler, Pinkowitz, Stulz, and Williamson (1999):

$$CASH\_STOCK_t = \beta_0 + \beta_1 MTB_t + \beta_2 LOGAT_t + \beta_3\, CF_t + \beta_4 NWC_t + \beta_5\, RD_t + \beta_6 INDSIGMA_t + \beta_7 LEV_t + \beta_8\, CAPEX_t + \beta_9 DIV_t \tag{B.1}$$

where $CASH\_STOCK_t$ is cash-to-asset ratio (Compustat data item formula: CHE/AT); MTB_t is market-to-book ratio (Compustat data item formula: (AT+(PRCC*CSHO)-CEQ)/AT); $LOGAT_t$ is a natural logarithm of total assets (Compustat data item AT) expressed in terms of purchasing power in 1999; CF_t is a ratio of cash flows to total assets (Compustat data item formula: (OIBDP-XINT-TXT-DVC)/AT); NWC_t is net working capital deflated by total assets (Compustat data item formula: (WCAP - CHE)/AT); RD_t is R&D expense deflated by total sales (Compustat data item formula: max(0,XRD)/SALE); $INDSIGMA_t$ is average standard deviation of cash flows (Compustat data item formula: (OIBDP-XINT-TXT-DVC)/AT) within each firm's 2-digit SIC code over the last 10 years with at least 5 years of available data; LEV_t is firm leverage (Compustat data item formula: (DLC+DLTT)/AT); $CAPEX_t$ is a ratio of capital expenditures to total assets (Compustat data item formula: CAPX/AT); DIV_t is an indicator variable equal to one if a firm paid common dividends (Compustat data item DVC) in the current year, and zero otherwise.

We estimate this model using all companies in Compustat with available data by year over our sample period. Note, that in order to maintain consistency with our earlier tests, we make two modifications to the original regression specification used in Opler, Pinkowitz, Stulz, and Williamson (1999). First, we follow Bates, Kahle, and Stulz, (2009) and use total assets instead of net assets as a deflator of cash holdings and relevant right-hand-side regression variables. Second, unlike Opler, Pinkowitz, Stulz, and Williamson (1999), we do not apply a logarithmic transformation to the dependent variable.

Dittmar and Mahrt-Smith (2007) estimate the optimal cash regression using both firm and yearly fixed effects, basing this specification on the argument that some firms hold cash for idiosyncratic reasons. As a sensitivity check, we also include firm and yearly fixed effects in the optimal cash regression to control for unobserved heterogeneity among firms. Our results are robust to this alternative specification.

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