Supplementary Appendix to "The Real Effects of Financing and Trading Frictions" *

Francesca Zucchi†

*The views expressed are those of the author and should not be interpreted as reflecting the views of the European Central Bank, the Eurosystem, or its staff.

†European Central Bank. Postal address: Sonnemannstrasse 20, 60314 Frankfurt, Germany. E-mail: francesca.zucchi@ecb.europa.eu

SA.1 Alternative assumptions about the firm financing

In this section, I consider alternative assumptions about the firm's financing. I keep the same assumptions about secondary market transactions and liquidity provision as in the main text, meaning that the endogenous bid-ask spread is pinned down following steps similar to those reported in Section 3 of the paper. This is done to preserve comparability and fairly assess robustness to alternative assumptions about the firm financing.

SA.1.1 Debt financing as bank credit lines

Small firms typically do not have access to the corporate bond or commercial paper markets, and are more likely to tap debt financing by drawing funds from bank lines of credit. A credit line is a source of funding that the firm can access at any time up to a pre-established limit L. Whenever the credit limit is finite ($L < \infty$), the firm has a positive demand for cash.[1] In this section, I assess the model results in the presence of this additional source of financing.

I follow BCW and assume that the firm pays a constant spread, β, over the risk-free rate on the amount of credit used. Because of this cost, it is optimal for the firm to tap the credit line when cash reserves are exhausted. The firm then uses cash as the marginal source of financing if $c \in [0, C_V(L)]$ (the cash region), where $C_V(L)$ denotes the target cash level in this environment. Conversely, the firm draws funds from the credit line when $c \in [-L, 0]$ (the credit line region). Firm value satisfies equation (5) in the cash region, whereas it satisfies

$$\begin{aligned}\rho V(c;\eta) = {} & [(\rho+\beta)c+\mu]\, V'(c;\eta) + \frac{\sigma^2}{2}V''(c;\eta) + \lambda\,[V(C_V;\eta) - V(c;\eta) - C_V + c] \\ & + \delta\left[(1-\min[\eta(c);\chi])V(c;\eta) - V(c;\eta)\right] \qquad \text{(SA.1)}\end{aligned}$$

in the credit-line region. On top of the smooth-pasting and super-contact conditions at $C_V(L)$

[1] As shown by Bolton et al. (2011), this is true for exogenous or endogenous (value-maximizing) L. Empirically, firms often face credit supply frictions that prevent them from taking the value-maximizing limit L. Endogenizing L is an interesting extension to understand the relation between stock liquidity and the firm's willingness to access bank credit, and I leave it for future research.

similar to (10) and (11), the system of ODEs (5)–(SA.1) is solved subject to the following boundary conditions. The first condition, $V(-L) = \max[\ell - L, 0]$, means that shareholders are residual claimants on the firm's liquidation value.[2] Moreover, the conditions $\lim_{c\uparrow 0} V(0) = \lim_{c\downarrow 0} V(0)$ and $\lim_{c\uparrow 0} V'(0) = \lim_{c\downarrow 0} V'(0)$ guarantee continuity and smoothness at the point where the cash and the credit line regions are pasted together.

Figure SA.1 studies the impact of the cost of liquidity provision when allowing for credit line availability. I use the parametrization in Table 1 in the main text and additionally set $L = 0.08$ and $\beta = 1.5\%$ (see Sufi, 2009). The figure shows that the effects of ν on corporate outcomes are similar irrespective of the firm's access to bank credit.[3] Access to credit relaxes the precautionary demand for cash, leading to a lower target cash level. Still, the target cash level continues to be decreasing with the costs borne by liquidity providers, which are passed on to firm shareholders and lead to an increase in the opportunity cost of cash. Moreover, the probability of liquidation and of payout continue to be increasing with ν. Finally, credit line availability does not affect much the zero-NPV cost—i.e., the maximum amount that the firm is willing to pay to exercise the growth option—which continues to be decreasing with ν as in the baseline model with no access to bank credit.

SA.1.2 Modeling financing frictions as issuance costs

Consistent with the difficulties faced by small firms in raising external funds, the baseline model developed in the paper features financing frictions as capital supply uncertainty. This section alternatively models such frictions as issuance costs, as in Décamps et al. (2011) or Bolton et al. (2011). In this setup, the firm chooses the timing of equity issuances rather than waiting for stochastic financing opportunities.

Namely, I assume that external financing entails proportional and fixed costs, denoted by ϵ and ψ, respectively. These costs prompt the firm to keep precautionary cash reserves,

[2] If if $\ell \geq L$, the credit line is fully secured.

[3] While, for the sake of brevity, the charts showcase the impact of the order-processing cost ν on corporate decisions, similar results continue to hold when instead investigating the impact of ω. Such results are available upon request.

and I continue to denote the target cash level by C_V. For any $c < C_V$, firm value satisfies:

$$\rho V(c;\eta) = (rc+\mu)\,V'(c;\eta) + \frac{\sigma^2}{2}V''(c;\eta) + \delta\left[(1-\min[\eta;\chi])V(c;\eta) - V(c;\eta)\right]. \qquad \text{(SA.2)}$$

This equation differs from equation (5) in the main text as the firm does not face stochastic financing opportunities. Rather, the firm sets financing decisions to minimize issuance costs. Namely, to economize on the fixed cost, the firm raises funds in a lumpy fashion when cash reserves are depleted. Denote the optimal issue size by C_*. The following condition then holds:

$$V(0) = V(C_*) - (1+\epsilon)C_* - \psi$$

which implies that firm value at $c = 0$ (the left-hand side of this equation) equals the firm's continuation value net of issuance cost (the right-hand side). Notably, it is optimal for the firm to raise external financing if the following inequality $V(C_*) - (1+\epsilon)C_* - \psi > \ell$ holds, which guarantees that the firm's continuation value (the left-hand side) is larger than the liquidation value (the right-hand side). The optimal issue size C_* satisfies $V'(C_*) = 1+\epsilon$, which warrants that the marginal benefit (the left-hand side of this equation) and cost of external financing (the right-hand side) are equalized at C_*. Lastly, Equation (SA.2) is subject to boundary conditions at the target cash level that are similar to (10) and (11) in the baseline version of the model.

Table SA.1 shows the effect of the cost of liquidity provision on the target cash level, the optimal issuance size, and the zero-NPV cost.[4] I use the baseline parameters in Table 1 and, in addition, consider two sets of values for the issuance costs. In the top panel, I set $\epsilon = 0.06$ and $\psi = 0.01$ as in BCW, whereas in the bottom panel I set $\epsilon = 0.10$ and $\psi = 0.03$, which account for the heterogeneity in financing costs documented by Hennessy and Whited (2007). Table SA.1 confirms that the target cash level decreases with ν, as so does the zero-NPV cost, consistent with the results in the baseline model. Furthermore, this setup allows to investigate how the cost of liquidity provision affects the optimal size of equity issues (i.e.,

[4]As in the analysis in Section SA.1.1, I focus on the parameter ν for the sake of brevity.

the endogenous quantity C_*). Indeed, Table SA.1 illustrates that C_* decreases with ν—i.e., the larger the cost of liquidity provision, the lower the size of refinancing events. Overall, this analysis shows that the cost of liquidity provision continues to affect the firm's financial and investment decisions irrespective of the way financing frictions are modeled—i.e., being costs or uncertainty in raising new funds.

SA.1.3 No financing frictions

In this Appendix, I consider the case in which the firm faces no financing frictions as it has a frictionless access to external financing—in the model, this is the case by assuming $\lambda \to \infty$. Under this assumption, as soon as the firm looks for external financing, it is able to find it with no delay. In this case, the firm is never liquidated and has no incentives to keep cash reserves. That is, because the firm can raise external financing at no delay nor costs, hoarding cash does not bring any benefit to shareholders (whereas cash has an opportunity cost). Given the absence of financing frictions, the Modigliani-Miller logic applies and the firm has many degrees of freedom in designing dividend and financial policies—yet, their impact on firm value is trivial.[5]

In this environment, I denote firm value by V^* and the bid-ask spread by η^*. Standard arguments imply that firm value satisfies the following equation:

$$\rho V^* = \mu + \delta \left[(1 - \min[\eta^*; \chi]) V^* - V^* \right]. \tag{SA.3}$$

The left-hand side of this equation is the return required by risk-neutral investors on each time interval, whereas the right-hand side is the expected change in firm value. Namely, the first term is the expected cash flow on each time interval (μ), whereas the second term is the impact of liquidity shocks on firm valuation (a term that admits an interpretation similar to that provided in the main text). In this setup, the bid-ask spread is determined by an indifference condition similar to that in the model with financing frictions, which gives the

[5] This result is similar to Décamps et al. (2011), see their Section II.

following bid-ask spread:

$$\eta^* = \nu + \zeta\omega(\delta V^*(\eta^*))^{-1}. \tag{SA.4}$$

Equations (SA.4) and (SA.3) together imply that, in this corner case too, costs borne by liquidity providers continue to be passed on the firm's investors, as firm value satisfies:

$$V^* = \frac{\mu - \zeta\omega}{\rho + \delta\nu}. \tag{SA.5}$$

Notably, both ν and ω lead to a decrease in firm value, as in the case with financing frictions. Also, trading frictions continue to affect investment, as the zero-NPV cost satisfies[6]

$$I^* = V^*(\eta^*, \mu_1) - V^*(\eta^*, \mu) = \frac{\mu_1 - \zeta\omega}{\rho + \delta\nu} - \frac{\mu - \zeta\omega}{\rho + \delta\nu} = \frac{\mu_1 - \mu}{\rho + \delta\nu}. \tag{SA.6}$$

Because financial policies (financing, payout, and cash holdings) are trivial absent financing frictions, the impact of trading frictions on such policies is trivial too. Overall, this analysis concludes that the case with financing frictions offers a more comprehensive analysis of the effect of illiquidity on corporate policies, which is particularly relevant in light of the empirical observation that firms with illiquid stocks are typically financially constrained, as discussed in the introduction of the paper.

SA.2 Alternative assumptions about the market of the firm's stock

SA.2.1 OTC market structure

This section extends the baseline model to allow for an OTC-like market structure, as it can be the case for small stocks. In this extension, I continue to assume that investors are hit by liquidity shocks at the jump times of a Poisson process with intensity δ. In addition, I now

[6]Interestingly, when there are no financing frictions, only ν ends up affecting the zero-NPV cost. In fact, the channel through which ω (and ζ) have an impact on the zero-NPV cost in the full model with financing frictions is through the target cash level, which is zero when $\lambda = \infty$.

assume that shocked shareholders are not able to find a liquidity provider with probability $1-\pi$, in which case they bear the holding cost χ. Conversely, with probability π, shocked shareholders trade with a liquidity provider, in which case they need to bargain over the terms of the trade. I denote by b the bargaining power of the liquidity provider, and by $1-b$ the bargaining power of the investors. Moreover, I assume that the liquidity providers have an outside option denoted by Ω.[7]

Using standard arguments, firm value satisfies the following HJB equation:

$$\begin{aligned}\rho V(c) = &(rc+\mu)\, V'(c) + \frac{\sigma^2}{2} V''(c) + \lambda[V(C_V) - V(c) - C_V + c] \\ &+ \delta\{-(1-\pi)\chi V(c) + \pi\left[(1-\eta(c))\, V(c) - V(c)\right]\}. \end{aligned} \tag{SA.7}$$

The terms in this equation admit an interpretation similar to equation (5) in Section 3—in particular, the last term on the right-hand side represents the impact of liquidity shocks on firm value. Yet, the associated payoff is different. Namely, with probability $1-\pi$, shocked shareholders do not sell the stock and bear the holding cost χ. Conversely, with probability π, they trade with liquidity providers, in which case they incur the endogenous bid-ask spread η stemming from the following bargaining problem:

$$\max_{\eta\in[0,\chi]} \left[-V(c)\eta + V(c)\chi\right]^{1-b} \left[\eta V(c) - \Omega\right]^{b} \tag{SA.8}$$

The first term is motivated by the fact that shocked shareholders bear the loss $\eta V(c)$ if bargaining goes through, whereas they bear the loss $\chi V(c)$ otherwise. The second term is motivated by the fact that, if bargaining does not go through, liquidity providers tap their outside option. Solving (SA.8) gives the equilibrium bid-ask spread:

$$\eta(c) = b\chi + (1-b)\Omega(V(c))^{-1}. \tag{SA.9}$$

This expression suggests that, if the outside option Ω or if the holding cost χ are greater,

[7] This is consistent with the idea in the main model that liquidity providers may tap other trading opportunities. For simplicity, I assume that the order-processing cost is set to zero in this extension.

liquidity providers can extract more rents from shocked shareholders, all else equal. Substituting equation (SA.9) into equation (SA.7) gives an ODE which is solved subject to conditions similar to those in the baseline case, i.e. $V(0) = \ell$ and $\lim_{c \uparrow C_V} V'(c) = 1$ at the liquidation threshold and at the target cash level, respectively. Again, the target cash level is identified by the super-contact condition, $\lim_{c \uparrow C_V} V''(c) = 0$.

Despite it is endogenized in a very different way, the equilibrium bid-ask spread assumes an analytical formulation similar to the baseline model and similarly feeds into the firm's valuation equation. Thus, the main predictions of the model continue to hold in this extension, as a two-way relation continues to arise between the bid-ask spread and firm value and policies. In fact, the bid-ask spread leads shareholders to require an additional compensation to invest in the firm which, as shown in the main model, constrains corporate policies and decreases firm value. When the bid-ask spread is endogenous, such a drop in firm value allows liquidity providers to extract larger rents from shocked investors as a proportion of the value of their claim, as illustrated by the second term of equation (SA.9). The equilibrium bid-ask spread then rises and feeds back into firm value, exacerbating the detrimental effects of the bid-ask spread.

As in the baseline model presented in the main text, variables that directly affect the bid-ask spread also affect corporate policies. Table SA.2 shows that the greater the liquidity providers' outside option Ω or their bargaining power b, the greater the bid-ask spread borne by liquidity-shocked investors (see the last column).[8] In turn, the ensuing impact on corporate policies is consistent with those discussed in the main model. Namely, a higher bid-ask spread reduces the firm's target cash level, increases the probability of payouts, and increases the probability of liquidation. It also reduces the zero-NPV cost and firm value. As in the baseline model, Table SA.3 shows that the gap between C_V and C^* widens as the firm's access to outside financing tightens (λ decreases) or cash flow volatility increases (σ increases)—meaning that stock illiquidity constrains cash choices when the firm needs it the

[8]In this numerical analysis, I use the same baseline parameterization as reported in Table 1 and, additionally, I assume that $p = 0.85$, $b = 0.5$, and $\Omega = 0.002$ so that the bid-ask spread is greater than in the analysis in Section 4.2 and equal to 108 basis points when the firm holds its target cash level. In the analysis that follows, I vary these parameters.

most. As a result, a shock leading to a decrease in λ or an increase in σ lead to an amplified increase in the firm's probability of liquidation—i.e., the gap in the liquidation probability between the case with endogenous bid-ask spread and the benchmark case with zero bid-ask spread widens in the wake of such shocks.

SA.2.2 DMM contract with a one-off fee

Section 4.4 of the paper assumes that the DMM contract requires the firm to correspond a periodic fee to the DMM, as reported by Bessembinder et al. (2015) or Menkveld and Wang (2013). In this Appendix, I instead study the implications of a DMM contract contemplating a lump-sum, one-off fee paid once and for all by the firm to the DMM at the outset of the contract.[9] Throughout this section, I denote such fee by Ψ.

In this case too, the contract requires the DMM to improve liquidity provision over the competitive case. Thus, the fee Ψ serves to compensate the DMM for this task. To keep the analysis parsimonious, I assume that the DMM quotes:

$$\eta_{DMM}(c) = \min\left[\eta(c)(1-\Delta), \bar{\eta}\right] \qquad \Delta > 0 \tag{SA.10}$$

where $\eta(c)$ is the bid-ask spread under competitive market forces (i.e., as derived in the main text).[10] I.e., consistent with the goal of the DMM contract, this formulation assumes that the DMM commits to quote the bid-ask spread below the one that would be delivered by competitive market forces (i.e., $\Delta > 0$). Moreover, under the contact, the bid-ask spread cannot exceed the contractual maximum $\bar{\eta}$. As in the case with periodic fee analyzed in the main text, I assume that $\bar{\eta} < \chi$, to focus on the relevant case.

Denote the firm value before entering the contract by $V(.)$ and the associated target cash

[9] I thank Thierry Foucault for suggesting this extension.

[10] It is worth noting that while equation (SA.10) is one way the DMM might guarantee better liquidity provision than under competitive market forces, alternative functional forms could be considered. For instance, a formulation such as $\eta_{DMM}(c) = \min\left[\eta(c) - \Delta, \bar{\eta}\right]$—which is then more similar to equation (17) considered in the main text—would lead to similar conclusions. Imposing additional assumptions to uniquely pin down $\eta_{DMM}(c)$ is beyond the scope of this extension.

level by C_V. After entering the contract, firm value is denoted by $V_{DMM}(.)$ and satisfies:

$$\rho V_{DMM}(c) = (rc + \mu)\, V'_{DMM}(c) + \frac{\sigma^2}{2} V''_{DMM}(c) + \lambda \left[V_{DMM}(C_{DMM}) - C_{DMM} + c - V_{DMM}(c) \right] + \delta \left[(1 - \eta_{DMM}(c)) V_{DMM}(c) - V_{DMM}(c) \right] \tag{SA.11}$$

where I denote by C_{DMM} the target cash level after the firm has entered the DMM contract. I.e., differently from equation (18) in the main text, the firm's revenues are not drained by the periodic fee in this case. Yet, the firm still enjoys a lower bid-ask spread compared to the competitive case.

To study under which conditions it is optimal to pay the fee Ψ and enter the DMM contract, I use arguments as in Décamps and Villeneuve (2007) and Hugonnier et al. (2015).[11] Namely, the firm finds it suboptimal to enter the contract if the upfront fee Ψ is such that

$$V_{DMM}(c - \Psi) - V(c) < 0$$

for any cash level c—i.e., if firm value uniformly decreases after entering the contract. The above inequality means that

$$\underbrace{c - C_V + V(C_V)}_{V(c)} > \underbrace{c - C_{DMM} - \Psi + V_{DMM}(C_{DMM})}_{V_{DMM}(c-\Psi)}$$

holds for any $c > \max[C_V, \Psi + C_{DMM}]$—as, indeed, recall that firm value is linear above the target cash level. The maximum fee that the firm is willing to pay to enter the DMM contract—denoted by $\bar{\Psi}$—can then be derived by making this inequality binding and satisfies:

$$\bar{\Psi} \equiv V_{DMM}(C_{DMM}) - C_{DMM} - (V(C_V) - C_V).$$

That is, the greater the increase in the enterprise value (i.e., firm value net of cash) thanks to the DMM contract, the greater the fee the firm is willing to pay to enter such a contract.

[11] I exploit similar arguments in Appendix A.1, where I study the firm's decision of whether to exercise the growth option.

While the analysis of the optimal stopping time at which the firm would enter the contract is beyond the scope of this extension,[12] one natural implication of this analysis is that only firms with a sufficient cash reserves would be able to enter it—otherwise they would need to wait for the arrival of financing opportunities or they would need to wait until they have accumulated a sufficiently-large cash reserve through internally-accumulated profits. Thus, while the lump-sum provision may make such contract optimal, it may not be accessible to firms with low cash reserves or with a tight access to external financing.

[12] Following Hugonnier et al. (2015), it could be or not a barrier strategy depending on the magnitude of $\Psi < \bar{\Psi}$.

References

Bessembinder, H., J. Hao, and K. Zheng (2015). Market making contracts, firm value, and the ipo decision. *Journal of Finance 70*, 1997–2028.

Bolton, P., H. Chen, and N. Wang (2011). A unified theory of tobin's q, corporate investment, financing and risk management. *Journal of Finance 66*, 1545–1578.

Décamps, J.-P., T. Mariotti, J.-C. Rochet, and S. Villeneuve (2011). Free cash flows, issuance costs and stock prices. *Journal of Finance 66*, 1501–1544.

Décamps, J.-P. and S. Villeneuve (2007). Optimal dividend policy and growth option. *Finance and Stochastics 11*, 3–27.

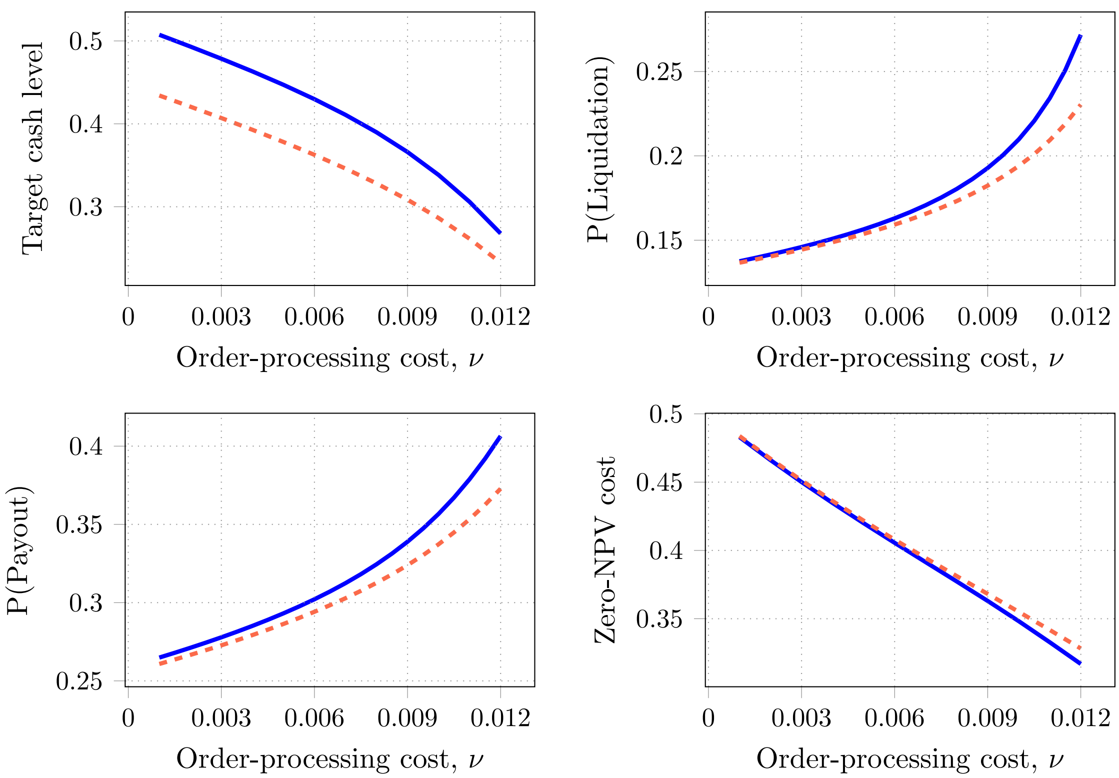
Hennessy, C. and T. Whited (2007). How costly is external financing? evidence from a structural estimation. *Journal of Finance 62*, 1705–1745.

Hugonnier, J., S. Malamud, and E. Morellec (2015). Capital supply uncertainty, cash holdings, and investment. *Review of Financial Studies 28*, 391–445.

Menkveld, A. and T. Wang (2013). How do designated market makers create value for small-caps. *Journal of Financial Markets 16*, 571–603.

Sufi, A. (2009). Bank lines of credit in corporate finance: An empirical analysis. *Review of Financial Studies 22*, 1057–1088.

Figure SA.1: Allowing for credit line availability.



The figure shows the target level of cash reserves, the probability of liquidation, the probability of payout, and the zero-NPV cost as a function of the order-processing cost ν borne by liquidity providers. The solid blue lines refer to a firm with no access to bank credit, whereas the red dashed lines refer to a firm having access to bank credit.

	Target Cash Level	Issuance Size	Zero-NPV investment cost
$\epsilon = 0.06$, $\psi = 0.01$			
$\nu = 0.001$	0.344	0.132	0.492
$\nu = 0.002$	0.338	0.131	0.476
$\nu = 0.003$	0.332	0.130	0.461
$\nu = 0.004$	0.327	0.129	0.447
$\nu = 0.005$	0.322	0.128	0.434
$\epsilon = 0.1$, $\psi = 0.03$			
$\nu = 0.001$	0.431	0.177	0.496
$\nu = 0.002$	0.424	0.175	0.480
$\nu = 0.003$	0.417	0.174	0.466
$\nu = 0.004$	0.411	0.173	0.452
$\nu = 0.005$	0.406	0.172	0.438

TABLE SA.1: MODELING FINANCING FRICTIONS AS ISSUANCE COSTS.

The table reports the target cash level, the size of equity issuances, and the zero-NPV investment cost when varying the order-processing cost ν. Proportional and fixed financing costs are respectively equal to $\epsilon = 0.06$ and $\psi = 0.01$ in the top panel, and equal to $\epsilon = 0.1$ and $\psi = 0.03$ in the bottom panel.

	Target cash level	Liquidation probability	Payout probability	Zero-NPV cost	Firm value	Bid-ask spread (basis points)
$\Omega = 0.001$	-28.82%	5.33%	7.61%	-30.71%	-31.10%	103
$\Omega = 0.003$	-30.23%	5.72%	8.07%	-31.02%	-31.97%	108
$\Omega = 0.005$	-31.76%	6.16%	8.58%	-31.38%	-32.84%	113
$\Omega = 0.007$	-33.46%	6.67%	9.15%	-31.78%	-33.72%	119
$\Omega = 0.009$	-35.33%	7.27%	9.80%	-32.25%	-34.62%	125
$b = 0.4$	-24.25%	4.19%	6.18%	-27.15%	-28.27%	86
$b = 0.5$	-29.51%	5.52%	7.83%	-30.86%	-31.53%	105
$b = 0.6$	-35.71%	7.40%	9.93%	-34.48%	-34.59%	124
$b = 0.7$	-43.27%	10.34%	12.71%	-38.04%	-37.50%	143
$b = 0.8$	-52.63%	15.51%	16.41%	-41.37%	-40.30%	162

TABLE SA.2: OTC MARKET STRUCTURE, ENDOGENOUS BID-ASK SPREAD, AND CORPORATE OUTCOMES.

The table studies corporate policies and outcomes as well as the endogenous bid-ask spread in the model extension featuring an OTC market structure. In particular, the table shows the change in the target cash level, in the probability of liquidation, in the probability of payout, in the zero-NPV investment cost, and in firm value at $c = C_V$ compared to the benchmark with perfect stock liquidity (i.e., zero bid-ask spread). The last column shows the corresponding equilibrium bid-ask spread (at $c = C_V$ too). The top panel varies the liquidity provider's outside option Ω, whereas the bottom panel varies the bargaining power b.

	Target cash level			Liquidation probability		
	C^*	C_V	Wedge	$\bar{P}_l(C^*)$	$\bar{P}_l(C_V)$	Wedge
$\lambda = 0.25$	0.638	0.418	-34.53%	15.08%	24.48%	9.40%
$\lambda = 0.50$	0.584	0.400	-31.54%	13.60%	20.26%	6.66%
$\lambda = 0.75$	0.546	0.385	-29.51%	12.78%	18.30%	5.52%
$\lambda = 1.00$	0.516	0.372	-28.00%	12.22%	17.07%	4.84%
$\lambda = 1.25$	0.493	0.361	-26.82%	11.81%	16.20%	4.38%
$\lambda = 1.50$	0.473	0.351	-25.86%	11.49%	15.53%	4.04%
$\sigma = 0.08$	0.347	0.266	-23.21%	11.48%	15.04%	3.56%
$\sigma = 0.10$	0.448	0.330	-26.32%	12.18%	16.65%	4.47%
$\sigma = 0.12$	0.546	0.385	-29.51%	12.78%	18.30%	5.52%
$\sigma = 0.14$	0.640	0.430	-32.79%	13.31%	20.03%	6.72%
$\sigma = 0.16$	0.731	0.467	-36.11%	13.80%	21.91%	8.11%
$\sigma = 0.18$	0.818	0.496	-39.40%	14.26%	23.93%	9.67%

TABLE SA.3: ENDOGENOUS BID-ASK SPREAD, CASH HOARDING, AND FORCED LIQUIDATION (OTC CASE).

The table reports the target cash level and the average liquidation probability in the benchmark environment in which the bid-ask spread is zero (respectively, second and fifth columns), in the OTC environment (third and sixth columns), and the gap between the two environments (fourth and seventh column) when varying the parameter representing the firm's access to external financing (λ) and cash flow volatility (σ).