# Online Appendices

# A. A simple analytical framework

## *A.1. Recapitalization under full information*

We consider a bank which would fail to meet the regulatory capital requirement in the loss state

$$\frac{A(1-l)-(D+B)}{A(1-l)} < \overline{\kappa},$$

but remains solvent, $A(1-l)-(D+B) > 0$.

The bank can recapitalize by issuing CoCos in the amount $F$ at date 0 or by liquidating assets $\Delta$ in the loss state at date 1. To recapitalize with CoCos, the bank needs to issue the MC CoCo amount

$$F^{MC} = \frac{D+B-A(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})} > 0, \tag{22}$$

or the PWD CoCo amount

$$F^{PWD} = \frac{D+B-A(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})-\eta} > 0. \tag{23}$$

To satisfy the investors' participation constraint, the bank needs to promise to investors the premium

$$P^{MC} = \frac{\theta}{1-\theta}[\frac{D+B-A(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})} - \alpha\frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B)], \tag{24}$$

$$P^{PWD} = \frac{\theta(1-\eta)}{1-\theta}\frac{D+B-A(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})-\eta}. \tag{25}$$

Note that the parameter restriction for $P^{PWD} \geq 0$ is $\eta < (1-l)(1-\overline{\kappa})$.

To deleverage by asset liquidation in the loss state, the bank needs to sell $\Delta$ such that

$$\frac{A(1-l)-(1+\lambda)\Delta-(D+B-\Delta)}{A(1-l)-(1+\lambda)\Delta} \geq \overline{\kappa}. \tag{26}$$

The minimum liquidation amount is

$$\Delta = \frac{1}{\overline{\kappa}(1+\lambda)-\lambda}[D+B-(1-\overline{\kappa})A(1-l)]. \tag{27}$$

A bank issuing an MC CoCo in the amount $F^{MC}$ at the premium $P^{MC}$ obtains the expected payoff

$$\begin{aligned}
\Pi^{MC} &= \theta(1-\alpha)[(A+F^{MC})(1-l)-(D+B)] \\
&\quad +(1-\theta)[(A+F^{MC})(1+\pi)-(D+B)-(F^{MC}+P^{MC})] \\
&= \theta[A(1-l)-(D+B)]+(1-\theta)[A(1+\pi)-(D+B)] \\
&\quad +F^{MC}(\theta(1-l)+(1-\theta)(1+\pi)-1)
\end{aligned}$$

A bank issuing a PWD CoCo in the amount $F^{PWD}$ at the premium $P^{PWD}$ obtains the expected payoff

$$\begin{aligned}\Pi^{PWD} &= \theta[(A+F^{PWD})(1-l)-(D+B+\eta F^{PWD})] \\ &\quad +(1-\theta)[(A+F^{PWD})(1+\pi)-(D+B)-(F^{PWD}+P^{PWD})] \\ &= \theta[A(1-l)-(D+B)]+(1-\theta)[A(1+\pi)-(D+B)] \\ &\quad +F^{PWD}(\theta(1-l)+(1-\theta)(1+\pi)-1)\end{aligned}$$

Given that the bank aims to issue the minimum amount required to satisfy the regulatory capital constraint in the loss state, it would choose $\eta$ to minimize $F^{PWD}$, i.e. $\eta = 0$. Note that for $\eta = 0$, the bank obtains the same expected payoff with either an MC or a PWD CoCo.

Suppose the bank recapitalizes by liquidating the assets at fire-sale prices at date 1. The bank's expected payoff in case of liquidation is

$$\begin{aligned}\Pi^{L} &= \theta[A(1-l)-(D+B)]+(1-\theta)[A(1+\pi)-(D+B)] \\ &\quad -\frac{\theta\lambda}{\overline{\kappa}(1+\lambda)-\lambda}[D+B-(1-\overline{\kappa})A(1-l)].\end{aligned}$$

To select its recapitalization strategy, the bank compares CoCo issuance payoff $\Pi^{MC} = \Pi^{PWD}$ and the asset liquidation payoff $\Pi^{L}$. Note that $\Pi^{MC} = \Pi^{PWD} > \Pi^{L}$. The reason is that a CoCo allows the bank to transfer payoffs between the profit and the loss states at a fair price, while asset liquidation can be done only at a discount. Hence, the bank always prefers to issue a CoCo at date 0 rather than recapitalize by liquidating assets in the loss state at date 1.

## A.2. Proof of Proposition 1

### A.2.1. Feasible payoffs

The state-contingent payoffs of the bank issuing an MC CoCo are

$$\begin{aligned} w_l^{MC} &= (1-\alpha)[(A+F)(1-l)-(D+B)] \\ &= (1-\alpha)\frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B), \end{aligned} \tag{28}$$

$$\begin{aligned} w_\pi^{MC} &= (A+F)(1+\pi)-(D+B)-(F+P) \\ &= A(1+\pi)-(D+B)+(\pi-\frac{\theta}{1-\theta})\frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)}+\alpha\frac{\theta}{1-\theta}\frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B) \end{aligned} \tag{29}$$

Then the set of feasible allocations attained by issuing an MC CoCo is

$$w_l^{MC} = \frac{1-\theta}{\theta}[A(1+\pi)-(D+B)]+\frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B)+(\pi\frac{1-\theta}{\theta}-1)\frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)}-\frac{1-\theta}{\theta}w_\pi^{MC}. \tag{30}$$

It is a segment located between the MC contracts with $\alpha = 0$ and $\alpha = 1$, where

$$w_l^{MC}(\alpha=0) = \frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B),$$

$$w_{\pi}^{MC}(\alpha=0) = A(1+\pi) - (D+B) + (\pi - \frac{\theta}{1-\theta})\frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)},$$

and

$$w_{l}^{MC}(\alpha=1) = 0$$

$$w_{\pi}^{MC}(\alpha=1) = A(1+\pi) - (D+B) + (\pi - \frac{\theta}{1-\theta})\frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)} + \frac{\theta}{1-\theta}\frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B)$$

The state-contingent payoffs of a bank issuing a PWD CoCo are

$$\begin{aligned} w_{l}^{PWD} &= (A+F)(1-l) - (D+B) - \eta F \\ &= A(1-l) - (D+B) + (1-l-\eta)\frac{D+B-A(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})-\eta} \end{aligned} \tag{31}$$

$$\begin{aligned} w_{\pi}^{PWD} &= (A+F)(1+\pi) - (D+B) - (P+F) \\ &= A(1+\pi) - (D+B) + (\pi - \frac{\theta(1-\eta)}{1-\theta})\frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)-\eta}. \end{aligned} \tag{32}$$

As the bank aims to minimize CoCo issuance amount $F^{PWD}$ defined by (23), it sets $\eta = 0$. The state contingent payoffs of a PWD-CoCo with $\eta = 0$ are the same as those of an MC contract with $\alpha = 0$,

$$w_{l}^{PWD}(\eta=0) = \frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B) = w_{l}^{MC}(\alpha=0),$$

$$w_{\pi}^{PWD}(\eta=0) = A(1+\pi) - (D+B) + (\pi - \frac{\theta}{1-\theta})\frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)} = w_{\pi}^{MC}(\alpha=0).$$

The state contingent payoffs of a bank recapitalizing by selling the assets in the loss state are

$$w_l^L = A(1-l) - (D+B) - \frac{\lambda}{\overline{\kappa}(1+\lambda)-\lambda}[D+B-(1-\overline{\kappa})A(1-l)], \tag{33}$$

$$w_\pi^L = A(1+\pi) - (D+B). \tag{34}$$

*A.2.2. Equilibrium CoCo issuance*

Figure A displays the equilibrium state-contingent payoffs $G_HB$ for type $\theta_H$ and $BE$ for type $\theta_L$ under asymmetric information. In contrast to the case of full information, issuing CoCos under the terms corresponding to $G_LB$ by type $\theta_L$ would induce a profitable deviation by type $\theta_H$ from a contract on $G_HBC$ to a contract on $G_LB$ and lead to a violation of the investors' participation constraint. Similarly, issuing a CoCo under the terms corresponding to $BC$ by type $\theta_H$ would induce a profitable deviation by type $\theta_L$ from a contract on $G_LBE$ to a contract on $BC$, leading to a violation of the investors' participation constraint.

Formally, the incentive compatibility of contracts which induce allocations $G_HB$ for type $\theta_H$ and $BE$ for type $\theta_L$ can be verified by checking the following constraints:

$$\theta_H w_{lH} + (1-\theta_H) w_{\pi H} \geq \theta_H w_{lL} + (1-\theta_H) w_{\pi L}, \tag{35}$$

$$\theta_L w_{lL} + (1-\theta_L) w_{\pi L} \geq \theta_L w_{lH} + (1-\theta_L) w_{\pi H}, \tag{36}$$

where $w_{li}$ and $w_{\pi i}$ are the state contingent payoffs of type $\theta_i$, $i = L, H$, for any $(w_{lH}, w_{\pi H}) \in G_HB$ and $(w_{lL}, w_{\pi L}) \in BE$.

Note that points $G_H$ and $G_L$ correspond to allocations induced by an MC contract with $\alpha = 0$ and a PWD contract with $\eta = 0$, and point $B$ corresponds to the state-contingent payoffs

$$w_\pi^B = [A(1+\pi) - (D+B)] + \pi \frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)},$$

$$w_l^B = \frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B) - \frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)}.$$

This allocation is implemented by an MC CoCo contract with $\alpha = \widehat{\alpha}$, where

$$\widehat{\alpha} = \frac{D+B-A(1-\overline{\kappa})(1-l)}{\overline{\kappa}(1-l)(D+B)}. \tag{37}$$

To verify (35), first note that

$$\theta_H w_{lH} + (1-\theta_H) w_{\pi H} = \Pi_H^*$$

Allocations $(w_{lL}, w_{\pi L}) \in BE$ are defined by (30), thus the RHS of (35) can be written as

$$\begin{aligned} & \theta_H w_{lL} + (1-\theta_H) w_{\pi L} \\ = \quad & -\frac{\theta_H - \theta_L}{\theta_L} w_{\pi L} + \theta_H [\frac{1-\theta_L}{\theta_L}(A(1+\pi) - (D+B)) \\ & + \frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B) + (\pi \frac{1-\theta_L}{\theta_L} - 1)\frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)}] \end{aligned}$$

That is, the deviation payoff $\theta_H w_{lL} + (1-\theta_H) w_{\pi L}$ is decreasing in $w_{\pi L}$. Hence the maximum deviation payoff on the segment $BE$ is attained at point $B$ where

$$w_{\pi L} = [A(1+\pi) - (D+B)] + \pi \frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)}. \tag{38}$$

At this point,

$$\theta_H w_{lL} + (1-\theta_H) w_{\pi L} = \Pi_H^*$$

and $\theta_H w_{lL} + (1-\theta_H) w_{\pi L} < \Pi_H^*$ for all other points on $BE$. Hence, (35) holds for all contracts on section $BE$.

To verify (36) note that

$$\theta_L w_{lL} + (1-\theta_L) w_{\pi L} = \Pi_L^*.$$

Also note that the section $G_H B$ contains MC contracts (30) and the $G_L$ corresponds to an MC contract with $\alpha = 0$ and a PWD contract with $\eta = 0$. For MC contracts inducing state contingent payoffs on segment $G_H B$, the deviation payoff of type $\theta_L$ is

$$\begin{aligned} & \theta_L w_{lH} + (1-\theta_L) w_{\pi H} \\ = \; & \frac{\theta_H - \theta_L}{\theta_L} w_{\pi H} + \theta_L [\frac{1-\theta_H}{\theta_H}[A(1+\pi) - (D+B)] \\ & + \frac{\overline{\kappa}}{1-\overline{\kappa}}(D+B) + (\pi \frac{1-\theta_H}{\theta_H} - 1) \frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)}] \end{aligned}$$

which is increasing in $w_{\pi H}$. Thus, on the segment $G_H B$ it attains the maximum at point $B$, where

$$w_{\pi H} = [A(1+\pi) - (D+B)] + \pi \frac{D+B-A(1-\overline{\kappa})(1-l)}{(1-\overline{\kappa})(1-l)}.$$

At this point, the bank obtains a deviation payoff $\Pi_L^*$ and it attains a deviation payoff $\theta_L w_{lH} + (1-\theta_L) w_{\pi H} < \Pi_L^*$ for any other MC contract on $G_H B$. Thus (36) holds for all contracts on $G_H B$.

The verification that contracts on sections $DB$ and $BC$ induce profitable deviations and lead to the violation of the investors' participation constraint is analogous and is omitted.

The incentive compatible allocations on the segments $G_H B$ for type $\theta_H$ and $BE$ for type $\theta_L$ are implemented by the following CoCo contracts. Type $\theta_H$ issues either a PWD-CoCo with $\eta = 0$ or an MC-CoCo with $\alpha \in [0, \widehat{\alpha}]$, where $\widehat{\alpha}$ is defined by (37). Type $\theta_L$ issues an MC-CoCo with $\alpha \in [\widehat{\alpha}, 1]$.

Another set of necessary conditions is that types $L$ and $H$ prefer to separate rather than pool with types $LL$ and $HH$ by not issuing any CoCos. If types $L$ and $H$ shareholders do not issue CoCos and hold on to their shares, in the event of a loss, they must engage in a costly recapitalization via fire-sales (which is suboptimal). If they do not issue CoCos and sell their shares at date 0 in the secondary market, their shares are valued as if they were a weighted average of types $LL$ and $HH$ (we assume that share trading in the secondary market is entirely anonymous and therefore cannot signal the type of insiders). The posterior beliefs over bank types, conditional on no CoCo issuance, are

$$\nu_{HH}(N) = \frac{\nu_{HH}}{\nu_{HH} + \nu_{LL}} \text{ and } \nu_{LL}(N) = \frac{\nu_{LL}}{\nu_{HH} + \nu_{LL}}.$$

The value of shares conditional on no CoCo issuance is then

$$\Pi(N) = \nu_{HH}(N)\Pi^*_{HH} + \nu_{LL}(N)\Pi^*_{LL}.$$

Since $\Pi^*_{HH} < \Pi^*_H < \Pi^*_L < \Pi^*_{LL}$, a necessary condition for types $H$ and $L$ to prefer to separate is

$$\nu_{HH} > \overline{\nu}_{HH} \equiv \frac{\nu_{LL}(\Pi^*_{LL} - \Pi^*_H)}{\Pi^*_H - \Pi^*_{HH}}.$$

Finally, we must verify that types $LL$ and $HH$ are better off issuing no CoCos rather than imitating type $H$ or type $L$. Type $LL$ shareholders can achieve their full-information payoff $\Pi^*_{LL}$ by not issuing CoCos and holding on to their shares. They cannot do better by imitating types $L$ or $H$. As for type $HH$, insider shareholders benefit from being pooled with type $LL$ and realizing the value $\Pi(N)$ by selling their shares at date 0. If they imitate $L$ by issuing a CoCo contract, they will raise funds $F$ that are insufficient to be able to absorb the loss $l_{HH}$. If the loss $l_{HH}$ is large enough (e.g. such that $A(1 - l_{HH}) - D - B - F < 0$), they don't gain anything by imitating $L$ and holding onto their shares. The last possibility is that they imitate type $L$ by issuing an MC contract with $\alpha \in [\widehat{\alpha}, 1]$ and immediately sell their shares. We rule out this possibility by assuming that type $L$ could prevent this imitation and separate itself from type $HH$ by including a lock-up provision in the CoCo contract preventing insiders from selling their shares in the secondary market. ■

The logic behind the separation of types $L$ and $H$ is related to the analysis of Cremer and McLean (1985). Types $L$ and $H$ can separate by shifting promised repayments to CoCo investors to the relatively less likely state for their type.[30] The general principle behind Proposition 1 is that bank-issuer types with a lower probability of facing a loss can signal this lower probability by promising to repay more in the state of nature where they are incurring a loss.

### *A.3. Proof of Proposition 2*

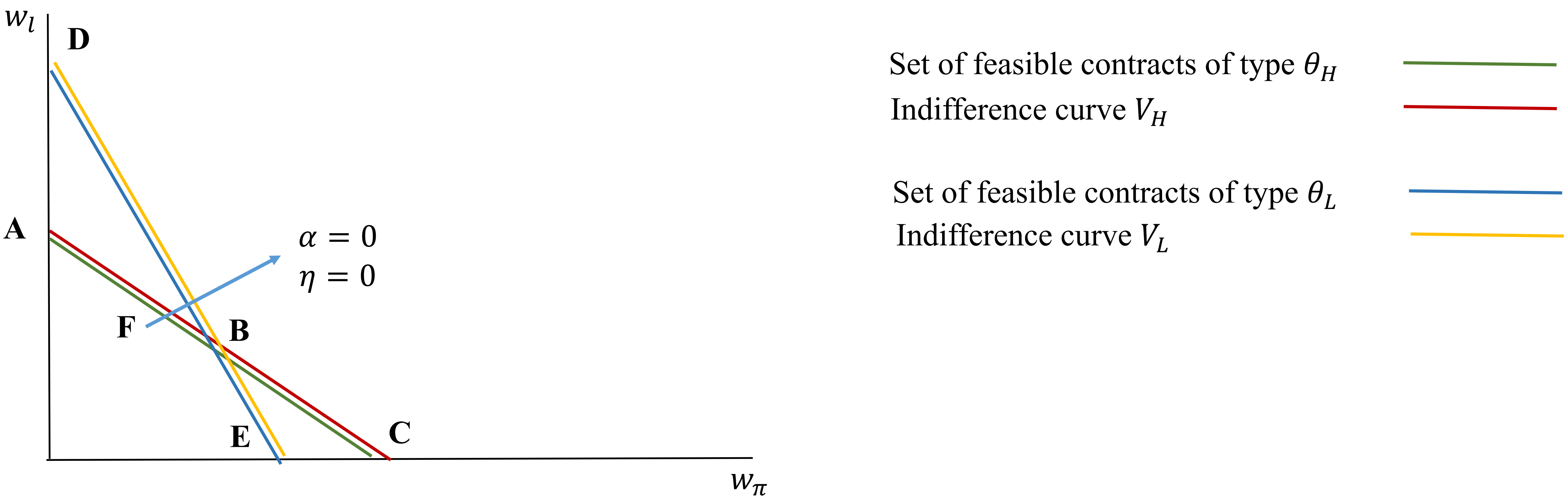
The stock price reaction of the announcement of a CoCo issue may be positive or negative depending on prior beliefs $(\nu_{LL}, \nu_L, \nu_H, \nu_{HH})$ and realized losses $(l_{LL}, l_L, l_H, l_{HH})$, where $l_H = l_L = l$. If

$$l < \nu_{LL} l_{LL} + \nu_L l_L + \nu_H l_H + \nu_{HH} l_{HH},$$

then the announcement of a CoCo issue is good news, which results in a positive stock price reaction. Otherwise, CoCo issuance is bad news, prompting a negative stock price reaction. Furthermore, a type $L$ bank will always have a greater stock price reaction than a type $H$ bank. As $\Pi_L^* > \Pi_H^*$, the stock price reaction of a bank type $L$ which issues an MC CoCo with $\alpha > \widehat{\alpha}$ will exceed that of a type $H$ bank which issues an MC CoCo with $\alpha < \widehat{\alpha}$ or a PWD CoCo with $\eta = 0$. Note that in either case, bank types $L$ and $H$ still decide to issue a CoCo to avoid a costly recapitalization. ■

[30] See J. Cremer and R. P. McLean (1985): "Optimal Selling Strategies Under Uncertainty for a Discriminating Monopolist When Demands Are Interdependent," Econometrica, 53, 345-361.

# Figure A: Recapitalization under asymmetric information



# B. A model with decreasing returns to scale

In this section, we present a model where a bank has decreasing returns to scale and, as a result, aims to limit CoCo issuance to the amount necessary to satisfy capital requirements in the low state. We capture decreasing returns to scale by assuming a piece-wise linear production function for simplicity, and assume that the return of the bank in the profit state is capped once assets reach a certain size. In the loss state, investing $A + F$ yields $(A + F)(1 - l)$. In the profit state, investing $A + F$ yields $(A + F)(1 + \pi)$ if $A + F \leq \widehat{A}$, and it yields $\widehat{A}(1 + \pi)$ if $A + F > \widehat{A}$. In this setting, the optimal bank size is equal to $\widehat{A}$. Further, without much loss of generality, we assume that prior to CoCo issuance, a bank operates at the optimal scale, $A = \widehat{A}$. Thus, as we show below, issuing CoCos involves both a regulatory cost and a benefit to the bank.

As in the basic model, we assume that the bank would fail to meet the regulatory capital requirement in the loss state,

$$\frac{\widehat{A}(1 - l) - (D + B)}{\widehat{A}(1 - l)} < \overline{\kappa}.$$

The bank can recapitalize by issuing a CoCo at date 0 or by liquidating assets $\Delta$ at date 1. To recapitalize with CoCos, the bank needs to issue at least the MC CoCo amount

$$F_{\min}^{MC} = \frac{D + B - \widehat{A}(1 - l)(1 - \overline{\kappa})}{(1 - l)(1 - \overline{\kappa})} > 0, \tag{39}$$

or at least the PWD CoCo amount

$$F_{\min}^{PWD} = \frac{D + B - \widehat{A}(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa}) - \eta} > 0. \tag{40}$$

To satisfy the investors' participation constraint, the bank needs to set the terms of the CoCo contract to satisfy

$$P^{MC} = \frac{\theta}{1-\theta}[F^{MC} - \alpha((\widehat{A} + F^{MC})(1-l) - (D+B))], \tag{41}$$

$$P^{PWD} = \frac{\theta}{1-\theta}(1-\eta)F^{PWD}. \tag{42a}$$

To deleverage by asset liquidation, the bank needs to sell $\Delta$ such that

$$\frac{\widehat{A}(1-l) - (1+\lambda)\Delta - (D+B-\Delta)}{\widehat{A}(1-l) - (1+\lambda)\Delta} \geq \overline{\kappa}. \tag{43}$$

The minimum liquidation amount is

$$\Delta = \frac{1}{\overline{\kappa}(1+\lambda) - \lambda}[D + B - (1-\overline{\kappa})\widehat{A}(1-l)]. \tag{44}$$

Consider first issuance of an MC CoCo in the amount $F^{MC}$ at the premium $P^{MC}$ which satisfy (41). The bank's expected payoff in this case is

$$\begin{aligned}\Pi^{MC} &= \theta(1-\alpha)[(\widehat{A}+F^{MC})(1-l)-(D+B)]+(1-\theta)[\widehat{A}(1+\pi)-(D+B)-(F^{MC}+P^{MC})]\\ &= \theta[\widehat{A}(1-l)-(D+B)]+(1-\theta)[\widehat{A}(1+\pi)-(D+B)]-(1-\theta(1-l))F^{MC}.\end{aligned}$$

Note that issuing a CoCo does not generate any return in the good state, as $\widehat{A}+F^{MC}$ exceeds the bank's optimal capacity $\widehat{A}$. The term $(1-\theta(1-l))F^{MC}$ measures the regulatory cost for the bank. A profit maximizing bank aims to minimize $F^{MC}$ and sets $F^{MC}=F^{MC}_{\min}$ defined by (39). The bank obtains the payoff

$$\begin{aligned}\Pi^{MC} &= \theta[\widehat{A}(1-l)-(D+B)]+(1-\theta)[\widehat{A}(1+\pi)-(D+B)]\\ &\quad -(1-\theta(1-l))\frac{D+B-\widehat{A}(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})}.\end{aligned}$$

It is decreasing in the capital requirement $\overline{\kappa}$, bank's leverage $D+B$, and the loss amount $l$.

Consider issuance of a PWD CoCo in the amount $F^{PWD}$ at the premium $P^{PWD}$ which satisfy (42a). The bank's expected payoff is

$$\begin{aligned}\Pi^{PWD} &= \theta[(\widehat{A}+F^{PWD})(1-l)-(D+B+\eta F^{PWD})]\\ &\quad +(1-\theta)[\widehat{A}(1+\pi)-(D+B)-(F^{PWD}+P^{PWD})]\\ &= \theta[\widehat{A}(1-l)-(D+B)]+(1-\theta)[\widehat{A}(1+\pi)-(D+B)]-(l\theta(1-\eta)+(1-\theta))F^{PWD}\end{aligned}$$

Similarly to an MC CoCo, issuing a CoCo leads to the regulatory costs $(l\theta(1-\eta)+(1-$

$\theta))F^{PWD}$. A profit-maximizing bank sets $F^{PWD} = F^{PWD}_{\min}$. Then the payoff can be written as

$$\Pi^{PWD} = \theta[\widehat{A}(1-l) - (D+B)] + (1-\theta)[\widehat{A}(1+\pi) - (D+B)] - C(\eta),$$

where $C(\eta)$ is the cost if issuance,

$$C(\eta) = (l\theta(1-\eta) + (1-\theta))\frac{D+B-\widehat{A}(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})-\eta}$$

Note that the cost $C(\eta)$ is increasing in $\eta$,

$$\begin{aligned}\frac{dC}{d\eta} &= [l\theta(1-\eta) + (1-\theta)]\frac{D+B-\widehat{A}(1-l)(1-\overline{\kappa})}{((1-l)(1-\overline{\kappa})-\eta)^2} - l\theta\frac{D+B-\widehat{A}(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})-\eta} \\ &= \frac{D+B-\widehat{A}(1-l)(1-\overline{\kappa})}{((1-l)(1-\overline{\kappa})-\eta)^2}[1-\theta+\theta l(1-(1-l)(1-\overline{\kappa}))] > 0.\end{aligned}$$

Hence, the bank issues a PWD CoCo with $\eta = 0$. This contract obtains the same expected payoff as an MC CoCo,

$$\begin{aligned}\Pi^{PWD} &= \theta[\widehat{A}(1-l) - (D+B)] + (1-\theta)[\widehat{A}(1+\pi) - (D+B)] \\ &\quad -(1-\theta(1-l))\frac{D+B-\widehat{A}(1-l)(1-\overline{\kappa})}{(1-l)(1-\overline{\kappa})}.\end{aligned} \tag{45}$$

Suppose the bank recapitalizes by liquidating the assets at fire-sale prices at date 1. In this case, the bank sells the amount $(1+\lambda)\Delta$ of assets to retire $\Delta$ of its senior unsecured debt $B$ to satisfy the capital requirement

$$\frac{\widehat{A}(1-l)-(1+\lambda)\Delta-(D+B-\Delta)}{\widehat{A}(1-l)-(1+\lambda)\Delta}\geq\overline{\kappa},$$

which requires the minimum amount

$$\Delta=\frac{1}{\overline{\kappa}(1+\lambda)-\lambda}[D+B-(1-\overline{\kappa})\widehat{A}(1-l)].$$

The bank's expected payoff in case of liquidation is

$$\begin{aligned}\Pi^{L} &= \theta[\widehat{A}(1-l)-(D+B)]+(1-\theta)[\widehat{A}(1+\pi)-(D+B)] \\ &\quad -\frac{\theta\lambda}{\overline{\kappa}(1+\lambda)-\lambda}[D+B-(1-\overline{\kappa})\widehat{A}(1-l)].\end{aligned}$$

To select its recapitalization strategy, the bank compares CoCo issuance payoff $\Pi^{MC}=\Pi^{PWD}$ and the asset liquidation payoff $\Pi^{L}$. It prefers to issue CoCos at date 0 when the liquidation costs are sufficiently high,

$$\lambda>\frac{\overline{\kappa}}{1-\overline{\kappa}}(1-\theta(1-l)). \tag{46}$$

Otherwise, the bank recapitalizes by liquidating assets in date 1.

This setting with decreasing returns to scale obtains the same qualitative predictions as the basic model presented in Section 3. The proofs are similar to the proofs presented in Appendix A, and are thus omitted.

## C. Impact of CoCo issuance - Empirical methodology

We conduct our empirical analysis of the impact of CoCo issuance on CDS spreads and equity prices in two steps.

In the first part, we employ the event methodology used in James (1987). The prediction error associated with CoCo instrument $j$ on day $t$ is defined as:

$$PE_{jt} = R_{jt} - (\alpha_j + \beta_j R_{mt}),$$

where $R_{jt}$ is the equity return or the change in the CDS spread on day $t$ of the bank that has issued CoCo instrument $j$; $R_{mt}$ is the return on the benchmark equity or CDS index on day $t$; $\alpha_j$ and $\beta_j$ are the estimated coefficients from a CAPM over an estimation period of 200 business days that excludes the 40 business days centered around the event date.

The cumulative prediction error (CPE) of CoCo instrument $j$ over an event window $(t_0 - T, t_0)$ is given by:

$$CPE_j =_{t=t_0-T}^{t_0} PE_{jt},$$

and the average cumulative prediction error (ACPE) over a sample of CoCo instruments of size $N$ is:

$$ACPE = \frac{1}{N}{}_{j=1}^{N} CPE_j.$$

Tests of statistical significance are based on cumulative standardized prediction errors (CSPE) over the event window $(t_0 - T, t_0)$ that account for the number of days in the estimation period and the length of the event window so as to control for the increase in variance from prediction outside the estimation period. The cumulative standardized prediction error for bank $j$ over the event window $(t_0 - T, t_0)$ is defined as:

$$CSPE_j =_{t=t_0-T}^{t_0} \frac{PE_{jt}}{S_{jt}},$$

where

$$S_{jt} = \left[ TV_j^2 \left[ 1 + \frac{1}{M} + \frac{(R_{mt} - \bar{R}_m)^2}{{}_{i=1}^{M}(R_{mi} - \bar{R}_m)^2} \right] \right]^{\frac{1}{2}}$$

and $M$ is the number of business days in the CAPM estimation, $V_j^2$ is the variance of the residual in CoCo instrument $j$'s CAPM regression and $\bar{R}_m$ is the mean market return over the estimation period.

The average cumulative standardized prediction error (ACSPE) over the event window $(t_0 - T, t_0)$ is:

$$ACSPE = \frac{1}{N}{}_{j=1}^{N} CSPE_j.$$

Assuming the individual prediction errors are independent across instruments, the $Z$ statistic

$$Z = \sqrt{N}(ACSPE)$$

is distributed as $N(0, 1)$ under the null hypothesis that the average cumulative standardized prediction error equals 0.

In the second part of our empirical examination of the impact of CoCo issuance on

CDS spreads and equity prices, we estimate multivariate cross-sectional regressions. More precisely, we focus on the following specification:

$$CPE_j = \alpha_j + \beta_j X_j, +u_j,$$

where $CPE_j$ are the cumulative prediction errors (defined above) over the event window $(t_0 - T, t_0)$ and $\mathrm{X}_j$ is a set of characteristics of the instrument and the issuing bank. More concretely, we focus on the main CoCo contractual features such as the conversion mechanism, the trigger type, and the trigger level. In order to properly account for multiple issuance by a single bank over the sample period, we use clustered regressions, assuming that the errors are independent across banks, but allowing them to be correlated within banks.

Since all continuous right-hand variables are demeaned, the estimate for the intercept in each specification represents an estimate for the impact of issuing a CoCo with the contract characteristic for which no dummy variable is designated (evaluated at the respective means of all continuous right-hand variables). For example, in specification (1) in Table 4, the estimate for the intercept also represents an estimate for the (average) impact of issuing a CoCo with an MC conversion mechanisms since this is the estimated impact of issuing a CoCo when the PWD dummy is equal to 0 (i.e. when the conversion mechanism is not PWD, but MC).■

## D. Additional Tables

**Table D1. CoCo Issuance, by conversion mechanism, 2009–15**

This table reports the amount issued (in billions of US dollars) of CoCos that (i) were issued by banks between January 2009 and December 2015 and (ii) have at least one (mechanical or discretionary) contractual trigger. The number of issues is indicated in parentheses. Individual subcategories do not always add up to the respective reported totals due to missing data and/or rounding. Sources: Bloomberg; Dealogic.

| | Conversion mechanism | | | | |
|---|---|---|---|---|---|
| | Principal write-down PWD | Full permanent PWD | Partial permanent PWD | Temporary PWD | Mandatory conversion MC |
| Advanced economies | 124.3 (182) | 75.1 (108) | 7.1 (6) | 42.1 (68) | 154.7 (194) |
| Euro area | 43.6 (56) | 9.3 (23) | 1.7 (1) | 32.6 (32) | 41.7 (41) |
| Non-euro area Europe | 58.1 (84) | 43.2 (43) | 5.4 (5) | 9.5 (36) | 61.2 (68) |
| Switzerland | 29.4 (28) | 28.3 (24) | 1.1 (4) | 0 (0) | 8.4 (4) |
| United Kingdom | 10.7 (6) | 10.7 (6) | 0 (0) | 0 (0) | 51.7 (60) |
| Other | 18.0 (50) | 4.2 (13) | 4.4 (1) | 9.5 (36) | 1.0 (4) |
| Non-European AEs | 22.6 (42) | 22.6 (42) | 0 (0) | 0 (0) | 51.8 (85) |
| Emerging market economies | 158.6 (258) | 137.6 (215) | 13.6 (26) | 6.9 (16) | 65.1 (26) |
| Emerging Asia | 130.0 (193) | 122.8 (174) | 5.8 (10) | 1.4 (9) | 62.2 (20) |
| Other EMEs | 28.6 (65) | 14.8 (41) | 7.8 (16) | 5.5 (7) | 2.9 (6) |
| Total | 282.9 (440) | 212.7 (323) | 20.8 (32) | 49.0 (84) | 219.8 (220) |

**Table D2. Propensity to Issue CoCos: Duration Analyses with the Top 500 banks**

This table analyses repeats the analysis in Table 2 Panel A except using the sample of the Top 500 banks only, i.e., not including CoCos from the advanced economy that are not among the top 500. The t-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Total assets | -8.957*** | -11.673*** | -9.019** | -7.798** | -15.243*** |
| | (-3.437) | (-3.639) | (-2.848) | (-2.484) | (-3.961) |
| Tier 1 | -2.884* | -3.003* | 7.321 | -2.297 | -1.145 |
| | (-1.693) | (-1.676) | (1.418) | (-1.301) | (-0.566) |
| GSIB | | -10.172 | -6.815 | -12.418 | -5.550 |
| | | (-0.826) | (-0.553) | (-0.994) | (-0.450) |
| Gross loans | | -0.319 | -0.592** | -0.537** | -0.331 |
| | | (-1.484) | (-2.425) | (-2.159) | (-1.319) |
| Trading securities | | -0.926** | -0.854** | -0.986** | -1.182** |
| | | (-2.351) | (-2.161) | (-2.350) | (-2.743) |
| Long term funding | | -0.167 | 0.277 | 0.229 | -0.177 |
| | | (-0.793) | (1.006) | (0.849) | (-0.821) |
| Deposits | | | 0.645** | | |
| (Bank+Customer) | | | (2.541) | | |
| Tier 1 ^ 2 | | | -0.631* | | |
| | | | (-1.951) | | |
| Customer deposits | | | | 0.584** | |
| | | | | (2.364) | |
| Bank deposits | | | | 1.681*** | |
| | | | | (3.345) | |
| Interbank borrowing | | | | | 0.676* |
| | | | | | (1.894) |
| Interbank assets | | | | | -0.317 |
| | | | | | (-0.920) |
| Number of observations | 493 | 491 | 491 | 491 | 486 |

**Table D3. Propensity to Issue CoCos: Duration Analyses on Subsamples prior to and post European Debt Crisis**

This table repeats the analysis in Table 2 Panel B except dividing the full sample into two subsamples 2009-2013 and 2014-2-15. The t-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Hazards to First CoCo Issuance 2009-2013

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Total assets | 0.429*** | 0.499*** | 0.466*** | 0.384*** | 0.490*** |
| | (4.35) | (4.31) | (3.49) | (3.05) | (3.80) |
| Tier 1 | 0.00126 | 0.00145 | 0.647* | 0.00199 | 0.0945 |
| | (0.21) | (0.23) | (1.71) | (0.32) | (1.30) |
| GSIB | | 0.0217 | 0.0207 | -0.0115 | 0.0686 |
| | | (0.05) | (0.04) | (-0.02) | (0.15) |
| Gross loans | | 0.0157*** | 0.0301*** | 0.0309*** | 0.0155 |
| | | (2.69) | (2.94) | (2.85) | (1.44) |
| Trading securities | | 0.0297 | 0.0229 | 0.0222 | 0.0412** |
| | | (1.64) | (1.08) | (0.99) | (2.21) |
| Long term funding | | 0.00499 | -0.0169 | -0.0136 | 0.00398 |
| | | (0.55) | (-1.22) | (-1.06) | (0.41) |
| Deposits | | | -0.0313*** | | |
| (Bank+Customer) | | | (-3.18) | | |
| Tier 1 ^ 2 | | | -0.0408 | | |
| | | | (-1.42) | | |
| Customer deposits | | | | -0.0233** | |
| | | | | (-2.44) | |
| Bank deposits | | | | -0.106*** | |
| | | | | (-3.58) | |
| Interbank borrowing | | | | | -0.0263* |
| | | | | | (-1.78) |
| Interbank assets | | | | | -0.0218 |
| | | | | | (-1.29) |
| Number of observations | 2493 | 2493 | 2493 | 2493 | 2472 |

**Table D4. Propensity to Issue CoCos: Duration Analyses with Competing Risk between Temporary and Permanent PWD**

This table repeats the analysis in Table 2 Panel C except focusing on the subsample of PWD CoCo issuance. In Panel A the main event is a permanent PWD issuance with a temporary PWD issuance serves as a competing risk. In Panel B the order of main and competing risks are reversed. The t-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Hazards to Permanent PWD Issuance (with Temporary PWD Issuance as Competing Risk)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Total assets | 0.333** | 0.394** | 0.403* | 0.279 | 0.608*** |
| | (2.11) | (2.02) | (1.85) | (1.34) | (3.40) |
| Tier 1 | 0.00105 | 0.00152 | 0.418* | 0.00177 | 0.0771 |
| | (1.13) | (1.53) | (1.75) | (0.45) | (1.04) |
| G-SIB | | 0.951** | 1.056** | 0.930** | 0.832* |
| | | (2.17) | (2.38) | (2.08) | (1.80) |
| Gross loans | | 0.0203*** | 0.0391*** | 0.0424*** | 0.0302** |
| | | (4.16) | (4.49) | (3.85) | (2.04) |
| Trading securities | | 0.0395*** | 0.0384** | 0.0502*** | 0.0685*** |
| | | (3.54) | (2.56) | (2.66) | (3.09) |
| Long-term funding | | 0.0212*** | 0.00140 | -0.00196 | 0.0175** |
| | | (3.46) | (0.14) | (-0.22) | (2.05) |
| Deposits | | | -0.0323*** | | |
| (Bank+Customer) | | | (-4.31) | | |
| Tier 1 ^ 2 | | | -0.0191* | | |
| | | | (-1.73) | | |
| Customer deposits | | | | -0.0226*** | |
| | | | | (-3.10) | |
| Bank deposits | | | | -0.168*** | |
| | | | | (-3.94) | |
| Interbank borrowing | | | | | -0.0489*** |
| | | | | | (-2.71) |
| Interbank assets | | | | | -0.0277 |
| | | | | | (-1.55) |
| Number of observations | 3323 | 3323 | 3323 | 3323 | 3296 |

| Panel B: Hazards to Temporary PWD Issuance (with Permanent PWD Issuance as Competing Risk) | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Total assets | 0.549*** | 0.600*** | 0.667*** | 0.535*** | 0.632*** |
| | (3.08) | (3.08) | (3.57) | (2.68) | (3.25) |
| Tier 1 | 0.00255*** | 0.00279*** | 0.609 | 0.00293*** | 0.122*** |
| | (2.69) | (2.88) | (1.43) | (2.94) | (3.36) |
| G-SIB | | -0.300 | -0.309 | -0.368 | -0.306 |
| | | (-0.42) | (-0.44) | (-0.51) | (-0.43) |
| Gross loans | | 0.00517 | 0.00553 | 0.00723 | 0.000986 |
| | | (0.54) | (0.43) | (0.53) | (0.11) |
| Trading securities | | 0.0262 | 0.0233 | 0.0272 | 0.0269 |
| | | (1.25) | (1.03) | (1.08) | (1.47) |
| Long-term funding | | 0.0107 | 0.00768 | 0.00667 | 0.0129 |
| | | (1.14) | (0.73) | (0.65) | (1.35) |
| Deposits | | | -0.0115 | | |
| (Bank+Customer) | | | (-1.11) | | |
| Tier 1 ^ 2 | | | -0.0282 | | |
| | | | (-1.09) | | |
| Customer deposits | | | | -0.00516 | |
| | | | | (-0.47) | |
| Bank deposits | | | | -0.0465** | |
| | | | | (-1.99) | |
| Interbank borrowing | | | | | -0.00228 |
| | | | | | (-0.19) |
| Interbank assets | | | | | -0.0111 |
| | | | | | (-0.82) |
| Number of observations | 3323 | 3323 | 3323 | 3323 | 3296 |

**Table D5. Impact of CoCo Issuance on Issuers' CDS Spreads: Cumulative Prediction Error (CPE) Analyses**

This table examines the impact of CoCo issuance on issuing banks' CDS spreads using the methodology of James (1987). The average cumulative prediction errors (ACPE) for each category are calculated as equally-weighted averages of the cumulative prediction errors (CPEj) for the set of CoCo instruments that belong to each category. The weighted average cumulative prediction errors (WACPE) are calculated as issued, amount-weighted averages of the CPE for the set of CoCo instruments that belong to each category. For each CoCo instrument j, $CPE_j$ is defined as the cumulative prediction error (derived from a CAPM model, estimated over a period of 200 business days, excluding the 40 business days centered around the event date) of its issuer's CDS spread over the event window, which starts 10 business days before the issuance date (t-10) and ends on the issuance date (t). The "Z-value" is defined as $Z = \sqrt{N}$ (ACSPE), where ACSPE is the average cumulative standardized prediction error and N is the sample size. "Proportion negative" is the proportion of negative $CPE_j$. The test statistic is a Wilcoxon signed rank statistic. The null hypothesis is that the proportion of negative prediction errors equals 0.5. The trigger threshold of 5.125% is the minimum required for a CoCo to qualify as additional tier 1 (AT1) capital under Basel III. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample covers CoCo instruments issued by banks in advanced economies between January 2009 and December 2015.

| | | ACPE | Z-value | Proportion negative | WACPE | Sample size |
|---|---|---|---|---|---|---|
| All CoCos | | -2.66*** | -2.70 | 0.57** | -4.81 | 136 |
| Conversion mechanism | | | | | | |
| Full permanent PWD | | -1.11 | -1.08 | 0.56 | -1.39 | 50 |
| Mandatory conversion (MC) | | -4.97*** | -3.07 | 0.63*** | -8.37 | 49 |
| Trigger | | | | | | |
| Mechanical trigger (MT) | | -3.25** | -2.22 | 0.55** | -4.80 | 83 |
| <=5.125 | | -3.36 | -1.38 | 0.60 | -5.57 | 50 |
| >5.125 | | -3.08* | -1.83 | 0.48 | -3.91 | 33 |
| Discretionary trigger only (DT) | | -1.08 | -1.15 | 0.58 | -2.14 | 50 |
| Full permanent PWD and MT | | -0.74 | -0.93 | 0.55 | -0.41 | 22 |
| Full permanent PWD and MT<=5.125 | | -0.63 | -1.16 | 0.58 | -1.08 | 12 |
| Full permanent PWD and MT>5.125 | | -0.88 | -0.12 | 0.50 | 0.69 | 10 |
| Full permanent PWD and DT only | | -1.36 | -0.59 | 0.56 | -2.80 | 27 |
| MC and MT | | -6.15** | -2.13 | 0.57* | -8.26 | 30 |
| MC and MT<=5.125 | | -10.58 | -1.64 | 0.69 | -21.71 | 13 |
| MC and MT>5.125 | | -2.76 | -1.39 | 0.47 | -2.43 | 17 |
| MC and DT only | | -1.46* | -1.66 | 0.71* | -1.24 | 17 |
| Additional Tier 1 | | -4.17*** | -2.63 | 0.57** | -6.69 | 75 |
| Tier 2 | | -0.67 | -1.00 | 0.57 | -0.35 | 60 |
| CoCo issue size | <median | -1.76 | -1.46 | 0.58* | -1.66 | 79 |
| *(amount issued/ RWA)* | >=median | -4.36** | -2.56 | 0.57* | -7.21 | 54 |
| Issuer size | <$1000bn | -4.04*** | -2.63 | 0.62*** | -8.97 | 68 |
| *(total assets)* | >=$1000bn | -1.54 | -1.25 | 0.54 | -2.18 | 65 |
| Issuer | G-SIB | -1.53 | -1.15 | 0.53 | -2.03 | 72 |
| | Non-G-SIB | -3.93*** | -2.72 | 0.63*** | -9.74 | 64 |
| European issuance | | -3.15** | -2.20 | 0.55* | -5.33 | 93 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Non-European issuance | | -1.59 | -1.58 | 0.63 | -2.38 | 43 |
| Distance to trigger | <median | -5.78 | -1.37 | 0.55 | -9.13 | 31 |
| *(Regulatory T1 capital/RWA)* | >=median | -2.13* | -1.84 | 0.57* | -1.83 | 49 |
| First-time issuer | | -2.90 | -0.40 | 0.48 | -6.17 | 40 |
| Repeat issuer | | -2.55*** | -2.93 | 0.61*** | -4.01 | 94 |

**Table D6. Impact of CoCo Issuance on Issuers' Equity Prices: Cumulative Prediction Error (CPE) Analyses**

This table examines the impact of CoCo issuance on issuing banks' equity prices using the methodology of James (1987). The average cumulative prediction errors (ACPE) for each category are calculated as equally-weighted averages of the cumulative prediction errors ($CPE_j$) for the set of CoCo instruments that belong to each category. The weighted average cumulative prediction errors (WACPE) are calculated as issued amount-weighted averages of the CPE for the set of CoCo instruments that belongs to each category. For each CoCo instrument j, $CPE_j$ is defined as the cumulative prediction error (derived from a CAPM model, estimated over a period of 200 business days, excluding the 40 business days centered around the event date) of its issuer's equity price over the event window, which starts 5 business days before the issuance date (t-5) and ends on the issuance date (t). The "Z-value" is defined as $Z = \sqrt{N}$ (ACSPE), where ACSPE is the average cumulative standardized prediction error and N is the sample size. "Proportion negative" is the proportion of negative $CPE_j$. The test statistic is a Wilcoxon signed rank statistic. The null hypothesis is that the proportion of negative prediction errors equals 0.5. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample covers CoCo instruments issued by banks in advanced economies between January 2009 and December 2015.

| | | ACPE | Z-value | Proportion negative | WACPE | Sample size |
|---|---|---|---|---|---|---|
| All CoCos | | 0.15 | 0.76 | 0.35 | 0.27 | 170 |
| Conversion mechanism | | | | | | |
| Full permanent PWD | | -0.11 | -0.17 | 0.52 | -0.18 | 58 |
| Mandatory conversion (MC) | | -0.04 | -0.07 | 0.88 | -0.74 | 67 |
| Trigger | | | | | | |
| Mechanical trigger (MT) | | 0.40 | 1.02 | 0.23 | 0.60 | 97 |
| <=5.125 | | -0.17 | 0.73 | 0.29 | 0.04 | 65 |
| >5.125 | | 1.55 | 0.73 | 0.55 | 1.32 | 32 |
| Discretionary trigger only (DT) | | -0.24 | -0.07 | 0.95 | -0.38 | 67 |
| Full permanent PWD and MT | | 0.17 | 0.05 | 0.52 | 0.06 | 25 |
| Full permanent PWD and MT<=5.125 | | 0.09 | -0.01 | 0.56 | -0.24 | 18 |
| Full permanent PWD and MT>5.125 | | 0.38 | 0.10 | 0.43 | 0.85 | 7 |
| Permanent PWD and DT only | | -0.36 | -0.32 | 0.52 | -0.57 | 31 |
| MC and MT | | -0.08 | -0.35 | 0.92 | -0.82 | 37 |
| MC and MT<=5.125 | | -0.12 | 0.32 | 0.65 | -0.34 | 18 |
| MC and MT>5.125 | | -0.04 | -0.80 | 0.66 | -1.07 | 19 |
| MC and DT only | | 0.04 | 0.41 | 0.86 | -0.11 | 28 |
| Additional Tier 1 | | 0.23 | 0.71 | 0.26 | 0.35 | 92 |
| Tier 2 | | 0.06 | 0.35 | 0.79 | 0.13 | 78 |
| CoCo issue size | <median | 0.33 | 1.44 | 0.12 | 0.14 | 92 |
| *(amount issued/ RWA)* | >=median | 0.37 | -0.17 | 0.99 | 0.43 | 69 |
| Issuer size | <$1000bn | 0.65 | 1.30 | 0.27 | 1.75 | 96 |
| *(total assets)* | >=$1000bn | -0.04 | 0.09 | 0.85 | -0.74 | 67 |
| Issuer | G-SIB | 0.06 | 0.35 | 0.79 | -0.27 | 74 |
| | Non-G-SIB | 0.22 | 0.70 | 0.48 | 1.13 | 96 |
| European issuance | | 0.17 | 0.37 | 0.58 | 0.43 | 111 |
| Non-European issuance | | 0.11 | 0.78 | 0.46 | -0.24 | 59 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Distance to trigger | <median | 1.40* | 1.65 | 0.19 | 1.66 | 40 |
| *(Regulatory T1 capital/RWA)* | >=median | 0.29 | 0.50 | 0.38 | -0.26 | 51 |
| First-time issuer | | 0.76 | 1.62 | 0.10 | 1.36 | 57 |
| Repeat issuer | | -0.23 | -0.45 | 0.78 | -0.41 | 108 |

**Table D7. CoCo Issuance, 2009–15**

This table reports the amount issued (in billions of US dollars) of CoCos that (i) were issued by banks between January 2009 and December 2015 and (ii) have at least one (mechanical or discretionary) contractual trigger. The number of issues is indicated in parentheses. Individual subcategories do not always add up to the respective reported totals due to missing data and/or rounding. The number of issues for some individual categories may exceed the respective number of issues in Tables 3, 5, C5 and C6 due to the exclusion of duplicate instruments and preferred shares from the benchmark analysis and the fact that CDS spreads and equity prices are not available for some CoCo-issuing banks. The G-SIB designation refers to a global systemically important bank. The trigger threshold of 5.125% is the minimum required for a CoCo to qualify as additional tier 1 (AT1) capital under Basel III. Sources: Bloomberg; Dealogic.

| | Mechanical trigger | | | Discretionary trigger only | Tier classification | | Distance to trigger | | GSIB designation | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All levels | <=5.125 | >5.125 | | AT 1 | Tier 2 | >= median | < median | GSIB | Non-GSIB |
| Conversion mechanism | | | | | | | | | | |
| Principal write-down | 96.6 (117) | 33.1 (32) | 63.5 (85) | 27.5 (65) | 80.3 (111) | 42.3 (67) | 48.2 (55) | 46.7 (47) | 81.4 (83) | 42.9 (99) |
| Mandatory conversion | 110.1 (126) | 47.9 (37) | 62.3 (89) | 38.8 (66) | 108.1 (117) | 29.9 (41) | 18.3 (17) | 71.2 (60) | 43.0 (25) | 111.7 (169) |
| Mechanical trigger: all levels | | | | | 158.6 (182) | 29.6 (22) | 66.5 (72) | 118.0 (107) | 102.2 (69) | 104.5 (174) |
| <=5.125 | | | | | 65.5 (56) | 13.8 (12) | 19.0 (19) | 61.0 (44) | 43.3 (27) | 37.7 (42) |
| > 5.125 | | | | | 93.1 (126) | 15.8 (10) | 47.5 (53) | 57.0 (63) | 58.9 (42) | 66.9 (132) |
| Discretionary trigger only | | | | | 23.8 (40) | 43.3 (91) | N.A. | N.A. | 18.3 (38) | 48.7 (93) |
| Tier classification | | | | | | | | | | |
| AT 1 | | | | | | | 46.5 (56) | 106.6 (100) | 89.4 (63) | 98.9 (165) |
| Tier 2 | | | | | | | 20 (15) | 9.6 (6) | 34.9 (45) | 38.3 (72) |
| Distance to trigger | | | | | | | | | | |
| >= median | | | | | | | | | 47.7 (32) | 18.8 (40) |
| < median | | | | | | | | | 54.5 (37) | 63.5 (70) |