

Corporate Bond Clawbacks as Contingent Capital for Large Financial Institutions*

April 2012

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*Preliminary and incomplete. Do not cite

Abstract

A bond with a clawback provision (IPOC) allows the issuer to partially redeem a bond issue often within three years of issuance using proceeds only from new equity issues. In this paper, we propose an IPOC-like security as an alternative source of contingent capital for large financial institutions (LCFIs). Compared to other forms of contingent capital proposed in the extant literature, the proposed instrument is likely to be more successful at reducing the “debt overhang” problem observed during a financial crisis. By means of a simple equilibrium model in which a bank owner/manager maximizes her expected utility by choosing the bank’s loans supply and the amount of junior debt, we show (numerically solving the model) that it is in her interest to take corporate actions (i.e. the conversion of this junior debt into equity) that moves the bank capital adequacy ratios above the regulator’s minimum requirements, getting around the so called “trigger problem”. The outcome of the model is the result of the trade off the manager faces between the private benefits of control, derived from her ownership in the bank, and the expected costs of financial distress imposed on her upon bankruptcy or liquidation. Our model endogenises many features of the actual decision problems faced by banks, contributing to the current debate on the design of contingent capital securities.

1 Introduction

In a corporate bond clawback, IPOC, the debtor has the option to redeem a preset fraction of the bond within a preset period at a predetermined price as long as the funds used for the debt redemption come from an equity offering. In this paper we propose a IPOC-like security as an alternative to the contingent capital proposal suggested by Flannery (2009), the call option enhanced reversed convertibles (COERCs) proposal suggested by Pennacchi et. al. (2010). and the capital access bonds proposed by Bolton and Samama (2011). IPOCs¹, sometimes called an equity clawback, grew out of the high yield debt market of the 1980s. Also, some large thrift institutions were able to successfully raise significant risk capital with IPOCs during their period of financial distress.²

Flannery (2009) proposes stabilizing large financial institutions (LFIs) with contingent capital certificates (CCCs) during financial distress. Given the Emergency Economic Stabilization Act of 2008 and Reinvestment Act of 2009 may not stabilize the United States financial system LCFIs may need capital buffers as indicated by Basel 3. Pennacchi et. al. (2011) also proposes an alternate contingent capital certificate program based upon call option enhanced reverse convertible debt (COERCs). Similarly, to the Flannery (2009) proposal COERCs are a bond that converts to equity when the market value of equity falls below a threshold value. Calomiris and Herring (2011) recognize that any effective contingent convertible debt requirement encourages effective risk governance by banks and addresses the uncertainty about the proper amount of capital held by banks. Sudaresan and Wang (2010) also investigate the proper amount of capital held by banks by using a stock price trigger for mandatory conversion of debt to equity during periods of financial distress.³

¹IPOC stands for initial public offering clawback.

²Berkeley Federal bank and Trust was able to successfully offer a \$100,000,000 subordinated debt with a clawback provision in 1995. IPOCs are also very attractive because they are subordinated debt which allows the concept of market discipline to have a significant impact on the behavior of large complex financial institutions.

³Lloyd Bank has issued a contingent convertible bond that is convertible into ordinary shares if the Tier

In response to financial conditions affecting the banking system and financial markets and the potential threats to the solvency of investment banks and other financial institutions, the United States government has taken unprecedented actions. On October 3, 2008 the Emergency Economic Stabilization Act of 2008 was enacted. The primary purpose of the law was to provide relief to the United States economy by giving the United States government the authority to develop programs to increase the supply of credit to the United States economy and to generally stabilize economic conditions.⁴ In addition, the Obama Administration issued a study, Financial Regulatory Reform- A New Foundation: Rebuilding Financial Supervision and Regulation, that recommends overhauling the United States financial regulatory system. Congress followed the blueprint recommended by the study and Dodd Frank Act was signed into law by President Obama on July 21, 2010. Although, significant regulatory reform has been introduced to the United States financial system the necessary capital structure for LFI's has not been significantly addressed by Dodd Frank or Basel 3. Seroni (2010) outlines the weaknesses of the current Basel Committee's capital adequacy framework. More importantly, imposing higher LFI's capital standards instills an incentive system that is complex and is not well understood by bank regulators or studied extensively in the banking literature. Sundaresan and Wang (2010) illustrate that proposals for bank to issue contingent capital may not lead to a unique equilibrium in equity or convertible debt prices and Prescott (2011) claims that the weak point of contingent capital is the trigger because conversion might occur when it is not desired.

We develop an equilibrium model in which an IPOC-like security is used to manage the "debt overhang problem" that LFI's may encounter during a financial crisis. Our intent is to supplement the existing proposals under consideration, such as CCCs and COERCs, not to replace them. However, we will illustrate the complex problems that face bank managers and investors when financial firms are under financial distress.

¹ capital ratio falls below 5%.

⁴Additional measures such as the Troubled Asset Relief Program and the Capital Purchase Program are ending and are not viewed as a permanent solution to the capital shortages that plague LFI's.

We solve the model numerically and show that a bank owner-manager will exercise the clawback provision (and convert a fraction of the junior debt into equity) in order to raise the bank capital adequacy ratio above the regulator's minimum requirement. Thus, one novelty of the model is that our IPOC-like security does not suffer from the so called "trigger problem". The voluntary exercise of the clawback provision results from the trade off the manager faces between the private benefits of control, via maximization of her expected utility (which is a function of her ownership in the bank) and the expected costs of financial distress imposed on her upon bankruptcy or liquidation. Another novelty of the model is that the supply of loans and the amount of debt a bank has are chosen by the bank manager (i.e. endogenous to the model) and subsequently the future cash flows of the bank are also endogenized. Thus, our model is very flexible, representative of today's bank conditions and environment faced by the bank managers. Lastly, we provide a sensitivity analysis of the manager's decision variables with respect to the proportion of debt that is exchanged for equity with the clawback provision.

The existing contingent capital proposals may not address the debt overhang problem in a comprehensive manner. The current capital adequacy framework gives LFIs significant latitude to issue innovative instruments in their regulatory capital. More importantly, Acharya et. al (2009) and Coletti (2009) show that LFIs increase their capital ratios by primarily issuing hybrid securities and only marginally by raising Core Tier 1 capital. Seroni (2010) indicates that the main reasons why LFIs issue hybrid capital instruments is to avoid dilution, take advantage of tax breaks and to appeal to their institutional investor clientele.⁵ Our position is that any successful capitalization program aimed at LFIs must take advantage of the existing market structure and securities. IPOCs play a fundamental role at reducing financial distress in the corporate sector and may be a viable tool in the financial sector if properly understood. We develop a sim-

⁵Flannery (2009) also indicates that banks are reluctant to issue new equity after incurring losses and this impedes the recapitalization process of banks under financial distress.

ple model that gives a rationale for the use of IPOCs by banks.⁶Our IPOC-like model determines the ex-ante consequences of the clawback provision and allow us to investigate the impact of certain contract features of the IPOC-like securities such as the percentage of the bank's equity that IPOC holders receive in exchange for their debt.⁷ To our knowledge there has not been a theoretical model which specifically analyzes the IPOC contract and its advantages as a supplementary contingent capital scheme.

The rest of the paper is structured as follows. We start with an anecdotal example of the use of an actual clawback provision by Western Financial Bank in Section 2. In Section 3, we present our IPOC-like contingent capital model for banks. In Section 4, we provide a numerical solution to the model. Section 5 concludes the paper.

2 A Clinical Example of IPOC Use - Western Financial Bank

Western Financial Bank (WFB) was founded as a federally chartered savings association in 1972 that focused on automobile lending. The bank was regulated by the Office of Thrift Supervision (OTS) and the Federal Deposit Insurance Corporation (FDIC). On April 29, 2002, WFB offered \$300,000,000 of 9 5/8% subordinated capital debentures due in 2012 with a clawback provision. Before the offering WFB had over \$8.7 billion in total managed loans and had portfolio earnings before interest and taxes of \$237 million. It was also deemed "well capitalized" as defined by the OTS. WFB was also one of the nation's largest independent automobile finance companies with a 29 year track history in automobile finance. Any casual observation of the company's market indicators or financials does not give any indication of a bank or industry in

⁶Theoretical models such as Brennan and Kraus (1987), Constantinides and Grundy (1989), and Stein (1992) are similar in style to our theoretical model. However, we emphasize that our motivation for the issuance of IPOCs presents a novel explanation for the capital structure and financing of the bank.

⁷More importantly, our analysis is able to infer the proper amount of equity capital that needs to be converted in a contingent capital framework in order to instill market discipline but also monitors the incentives of the bank managers to avoid dilution of the bank and the possible mitigation of corporate control.

financial distress. As the debt circular proudly states. “As a result of our sophisticated credit and underwriting systems, we are able to earn attractive risk-adjusted returns on our automobile loans. “ We find the WFB case an interesting example of “the false sense of security” alluded by the regulatory capital system. Although, well capitalized and with no apparent signal of financial difficulty, clearly WFB was under financial distress. Why would a well-established well-capitalized bank issue high-yield debt instruments into its capital structure? Given that hind sight is very clear, we know that WFB relied heavily on the securitization of the automobile loans and WFB had securitized \$24 billion of automobile contracts since 1985, making WFB the largest issuer of asset backed securities backed by automobile loans.⁸ WFB benefited very handsomely with a robust economy and the significant exposure to the automobile loan market. However, the 2000/2001 recession led to a slowing of the automobile lending market and a significant cash flow shortage to WFB. Interestingly, the financial documents of WFB do a very good job of under emphasizing the cash flow shortage that WFB was experiencing and it takes a trained eye to discover that WFB had negative earnings on earnings assets during the recession. Clearly, WFB depended on significant loan volume and securitization to drive their loan servicing model which worked very well up until 2001. More importantly, the capital ratios of WFB declined only modestly during the cash flow shortage with risk-based capital falling from 12.16% to 11.86% and tangible capital falling from falling from 8.03% to 7.29%. All of these amounts are significantly above the regulatory required minimum and again illustrate the weakness of the regulatory capital regime. WFB’s management response to a softening business model coupled with a slowing economy was to inject \$300,000,000 into its capital structure at a very high coupon rate. Although, the clawback provision gives the option to repay the debt with an equity offering, our anecdotal evidence suggests the clawback provision is rarely exercised. This suggests that the 9 5/8% subordinated debt is not

⁸This is a classic example of how insured deposits get mixed with aggressive growth in a risky securitization market. WFB started with securitization of \$110,000,000 in 1985 and grew to over \$3.6 billion in 2001.

short term financing but a significant long term hurdle. In fact, some interviews with high yield debt portfolio managers indicated that the high yield debt portfolio managers preferred to keep receiving the high coupon and viewed the clawback provision as a protection clause from repaying the debt with a cheaper debt issuance.⁹ WFB did not exercise the clawback option and eventually retired the remaining outstanding amounts of the debt in 2009. WFB also never fully recovered from the impact of the 2000/2001 recession and was eventually acquired by Wachovia Bank.

3 A Simple Model

For simplicity, we consider a three date model where p indicates the probability of repayment and \widetilde{CF}_t are the realized cash flows for different states of the world. In our model, since loans are short term instruments due at time $t = 1$, the cash flows from the loans made at time $t = 0$ are again loaned to the public at time $t = 1$ and are due at time $t = 2$. We assume that the characteristics of the set of potential borrowers the bank faces does not change over time. In this sense, for the loans made at time $t = 1$, there is a fixed probability $(1 - p)$ that a fraction d of the loans will default. All markets participants are risk neutral, so all market securities are priced at their expected values, and we normalize the risk free rate to zero.

We consider a bank with assets in place A_0 and an initial portfolio of short term loans with face value L_0 which generates random cash flows \widetilde{CF}_t . This portfolio is constituted by N identical individual loans. We assume that at each point in time, there is a fixed probability that a fraction d of the loans will default, affecting the overall cash flows of the bank. Accordingly, the realization of the cash flows can be $CF^u = L$ with probability p or $CF^l = dL$, with probability $(1 - p)$, with $d < 1$ and $p > \frac{1}{2}$. The

⁹The implies that the high yield debt portfolio managers are betting against a successful equity offering by the bank under financial distress. Our evidence suggests that this is a relatively good bet and most firms do not exercise the clawback. Our further analysis shows that the firm does use the clawback provision to renegotiate the debt and this may be another additional benefit of the clawback contract.

bank charges a loan rate $r^l > 0$, interest that is included in the value of L . We consider a three time period setup. At time $t = 0$, the manager, who is also the owner of the bank, provides funds in form of equity $-E_0$ that correspond to the initial capital of the bank, the bank receives long term senior deposits $-D_0$, which are due at time $t = 2$, and issues long term junior debt with face value B_0 . Given the bank's debt capacity and the demand for deposits it faces, the manager chooses the supply of loans, such that she maximizes her expected utility, subject to her wealth constraint, and that the minimum capital adequacy ratio - CAR - is met.

The owner/manager of the bank perceives private benefits of control that are proportional to the size of the bank assets and her ownership of the bank's equity. In particular, her utility function is given by:

$$U(W, \alpha) = W + (1 - \alpha) \psi S \quad (1)$$

where W is wealth, S is the market value of the total assets of the bank, $0 < \psi < 1$ represents the size of the private benefits of control as a fraction of the assets of the bank, and α is the percentage of equity owned by external investors, if any. We assume that the assets in place of the bank can be liquidated at time $t = 2$ and that the cash from the alienation of these assets, together with the cash flows from the lending activities of the bank, are enough to guarantee that the deposits of the bank will always be honored. We allow, however, for the possibility that the bank defaults - either totally or partially - in the payment of its junior debt. In this sense, the worst possible scenario for the bank occurs when there are low realizations of cash flows both at time $t = 1$ and $t = 2$, which occurs with probability $(1 - p)^2$. In such a case, the value of the loans at the beginning of time $t = 2$ would be d^2L . Accordingly, to allow for the possibility of financial distress, we assume that $B > A + d^2L - D \geq 0$. In any other circumstance, we assume that the bank is able to honor its junior debt. It is sufficient for this assumption to hold that $A + dL - D \geq B$. These conditions are summarized as follows:

Condition 1. $A + dL - D \geq B > A + d^2L - D \geq 0$

We assume that there exists costs of financial distress that the manager of the bank will bear upon default of the bank's junior debt. Specifically, we assume that the manager will face cost of financial distress that are proportional, to the initial amount of capital invested in the bank, cE_0 . For simplicity, we consider that the value of the assets in place, A , does not change over time. Since we impose the condition that $A + d^2L \geq D$, the value of the deposits, D , also remains constant through time.

3.1 Junior Debt with Clawback Provision

The Clawback Provision

We first analyze the case when the bank's junior debt B has an embedded *clawback provision* that is somehow triggered when the bank faces an increased probability of insolvency. In the model, this occurs at time $t = 1$ after the realization of a low cash flows arising from the fact that a fraction d of the loans have defaulted in their payment. Under these circumstance, the likelihood of the bank falling into financial distress has increased from $(1 - p)^2$ to $(1 - p)$ and it is possible that its equity over assets ratio, $\frac{E}{L+A}$, might have fallen below the minimum capital adequacy ratio, \underline{CAR} .

At time $t = 1$, the junior debt can be partially called by the issuing bank and converted into equity. A fraction γ of the debt, $0 < \gamma < 1$, is converted into equity upon conversion. Consequently, $(1 - \gamma)$ of the debt remains in the firm's capital structure. Let α be the fraction of the firm's equity that IPOCs' holders receive in exchange for the fraction γ of the outstanding debt being called. The conversion option expires at the end of time $t = 1$. The partial conversion of the junior debt affects the situation of the bank in two ways: first, the equity over assets ratio of the bank increases and, given the amount of outstanding debt and the conversion ratio, its increase might be enough to comply with the minimum capital adequacy ratio \underline{CAR} , and second, the remaining debt might become default free, in the sense that whatever is the outcome at time $t = 2$, the

bank will be able to honor its payment. We impose the condition that upon partial conversion, the remaining junior debt of the bank is default free, which also implies that the manager does not face the possibility of costly financial distress if she exercises the clawback provision:

Condition 2. $\frac{A+d^2L-D}{1-\gamma} \geq B$

The Book Value and Economic Value of Securities

Generally, capital requirements are expressed in terms of book value rather than economic value. The book value balance sheet of the bank at time $t = 1$ after a high realization of cash flows is presented in Table 1. After a low realization of cash flows, without the possibility to convert part of the debt into equity, the book balance sheet of the bank at time $t = 1$ would look like that presented in Table 2. Accordingly, the following condition is required so that the minimum capital requirement is satisfied at time $t = 1$ when the realization of cash flows is high, but is not met at time $t = 1$ after low value realization of cash flows:

Condition 3. $\frac{L+A_0-D_0-B_0}{L+A_0} > \underline{CAR} > \frac{Ld+A_0-D_0-B_0}{Ld+A_0}$

In what follows, we assume that condition (3) holds. Regarding the economic and book value of the different securities. Since at time $t = 2$ the value of the loans of the bank is known, it is possible to solve backwards for the values of the different securities at each point in time and cash flow realization. In the next section, this is done for a given parametrization of the model and the results are shown in Figure 1. At time $t = 2$, the states of nature for which there have been no conversion in the previous period correspond to the paths $u-u$ and $u-d$ through the nodes of the tree in Figure 1. For the path $u-u$, the value of the loans is L , the value of the junior debt of the bank is given by $B^{uu} = \text{Min}\{L + A_0 - D_0, B_0\} = B_0$, and the value of equity is given by $E^{uu} = \text{Max}\{0, L + A_0 - D_0 - B^{uu}\} = L + A_0 - D_0 - B_0$. For the paths $u-d$ and $d-u$, even though the value of the bank loans is the same, the value of equity depends

on the actual path that cash flows have followed. For the former path, there was no conversion at time $t = 1$, so the value of the loans of the bank is Ld , the value of the junior debt of the bank is given by $B^{ud} = \text{Min}\{Ld + A_0 - D_0, B_0\} = B_0$, and the value of equity is given by $E^{ud} = \text{Max}\{0, Ld + A_0 - D_0 - B^{ud}\} = Ld + A_0 - D_0 - B_0$. For the path $d-u$, according to the assumptions of the model, there was conversion of a fraction γ of the outstanding junior debt. It follows that the value of the loans is Ld , the value of the junior debt of the bank is given by $B^{du} = \text{Min}\{Ld + A_0 - D_0, B_0(1 - \gamma)\}$, and the value of equity is given by $E^{du} = \text{Max}\{0, Ld + A_0 - D_0 - B^{du}\}$. Since $dL > d^2L$, $B^{du} = B_0(1 - \gamma)$ and $E^{du} = Ld + A_0 - D_0 - B_0(1 - \gamma)$. Finally, for the path $d-d$, the value of the loans is d^2L , the value of the junior debt of the bank is given by $B^{dd} = \text{Min}\{Ld^2 + A_0 - D_0, B_0(1 - \gamma)\}$, and the value of equity is given by $E^{dd} = \text{Max}\{0, Ld^2 + A_0 - D_0 - B^{dd}\}$. If condition 2 holds, it follows that $B^{dd} = B_0(1 - \gamma)$ and $E^{dd} = Ld^2 + A_0 - D_0 - B_0(1 - \gamma)$.

Let's consider now what happens at time $t = 1$ after a high realization of cash flows. Regarding the value of loans, the bank receives the whole amount of money lent and, with these proceeds, make new loans to the public. The value of these loans is given by $L^u = pL + (1 - p)dL$, the value of the junior debt is $B^u = pB^{uu} + (1 - p)B^{ud} = B_0$, and the value of equity is $E^u = L^u + A_0 - D_0 - B_0 = pE^{uu} + (1 - p)E^{ud}$. After a low value realization of cash flows, we assume that the equity over assets ratio of the bank falls below the minimum capital adequacy ratio, \underline{CAR} , and partial conversion of the junior debt of the bank takes place.¹⁰ In this situation, the bank receives a fraction d of the loans made at time $t = 0$ and lends this amount to the public. The value of the loans of the bank is therefore $L^d = pdL + (1 - p)d^2L$, the value of the junior debt is $B^d = pB^{du} + (1 - p)B^{dd} = B_0(1 - \gamma)$. Finally, the value of equity is $E^d = L^d + A_0 - D_0 - B_0(1 - \gamma) = pE^{du} + (1 - p)E^{dd}$. It should be noted that in this case, the total value of equity is shared between the original shareholders -the manager of the bank - and new shareholders - bond holders whose debt have been partially converted

¹⁰We discuss below how conversion actually can take place.

into equity of the bank. The market value of the new equity is γB_0 and the value of the old equity is $E^d - \gamma B_0$.

The Problem of the Manager

At time $t = 1$ the bank faces an exogenous given demand for deposits D_0 and a set of potential borrowers characterized by their probability of default. In particular, we assume that all individuals in this set of borrowers require loans of amount l and that there is a probability $(1 - p)$ that a fraction d of this portfolio of loans will default in their payment. The manager chooses the supply of N identical loans and the amount of junior debt B to issue in order to maximize her expected utility, subject to the constraints that the initial total capital of the bank, E_0 , cannot exceed her wealth, W_0 , and that conditions (1) and (2) hold:

$$\underset{\{N, B\}}{\text{Max}} E [\tilde{W} + (1 - \alpha) \psi \tilde{S}] \quad (2)$$

s.t.

$$A_0 + dNl - D_0 \geq B > A_0 + d^2Nl - D_0 \geq 0$$

$$\frac{A_0 + d^2Nl - D_0}{1 - \gamma} \geq B$$

$$E_0 \leq W_0$$

$$\frac{E_0}{L + A_0} \geq \underline{CAR}$$

where $E(\tilde{W}) = p^2 E^{uu} + p(1 - p)(E^{ud} + E^{du}) + (1 - p)^2 E^{dd}$ and $E(\tilde{S}) = A_0 + p^2 L + 2p(1 - p)Ld + (1 - p)^2 Ld^2$. The bank's junior debt B has an embedded *claw-back provision*. For the moment, let's assume that this provision is triggered when the bank's equity over assets $\frac{E}{L+A}$ falls below the minimum capital adequacy ratio, \underline{CAR} . In the model, this may occur at time $t = 1$ when the realization of cash flows is low. In

such situation, debt can be partially called by the issuing bank and converted into equity at the current market price. A fraction γ of the debt, $0 < \gamma < 1$, is converted into equity upon conversion and bondholders get a fraction $\alpha = \frac{\gamma B_0}{E^d - \gamma B_0}$ of the equity of the firm. It should be noted that if, as assumed, condition (2) holds, conversion of the fraction γ of the junior debt after a low value realization of cash flows at time $t = 1$ reduces the expected costs of financial distress to zero. This is the reason why in the expression for the expected wealth of the manager, $E(\tilde{W})$, there are no expected costs of financial distress. If, on the contrary, conversion was not feasible (or chosen) at time $t = 1$, the expected wealth of the manager would be given by the expected value of the equity at time $t = 2$ minus the expected costs of financial distress, $(1 - p)^2 cE_0$.

Participation Constraints

Let N^* and B^* the supply of loans and the amount of debt issued by the bank that solves the program (2). Given that conditions (1) and (2) are imposed in the maximization problem, it is clear that debt, either the whole amount if no conversion takes place or the residual debt if conversion does take place, it is risk free. The expected pay to bondholders will be given by $p(B^*) + (1 - p) \left[(1 - \gamma) B^* + \frac{\gamma B^*}{E^d - \gamma B^*} E^d \right]$. Accordingly, bondholders will be willing to provide funds as long as:

$$p(B^*) + (1 - p) \left[(1 - \gamma) B^* + \frac{\gamma B^*}{E^d - \gamma B^*} E^d \right] \geq B^* \quad (3)$$

For the owner/manager of the bank, she will be willing to participate as long as her expected utility is larger than the value of the initial capital required by the bank:

$$E(\tilde{W} + (1 - \alpha) \psi \tilde{S}) \geq E_0 \quad (4)$$

4 Numerical Solution

Consider a bank with an exogenous given demand for deposits $D_0 = 300$ and assets in place $A_0 = 100$. The manager/owner of the bank chooses the supply of loans (N) and the amount of junior debt (B) to issue in order to maximize her expected utility, subject to the constraints described in the previous section. The utility function of the manager is given by equation (1), where $\psi = 5\%$; that is, at every point in time, the private benefits of control are equivalent to 5% of the current total assets of the firm. At time $t = 1$, the junior debt can be partially called by the issuing bank if a clawback provision is included in the indenture. In such case, a fraction $\gamma = 30\%$ of the debt can be converted into equity at market prices. If no clawback provision is included, the junior debt corresponds to straight debt with maturity at time $t = 2$. We assume that the minimum capital requirement is $\underline{CAR} = 20\%$ and that the initial wealth of the manager is $W_0 = 150$. The set of potential borrowers of the bank is constituted by individual who require individuals loans of $l = 50$ each. There is a 20% chance - $p = 0.8$ - that a fraction $d = 0.2$ of the loans will default. The lending rate is $r^l = 5\%$ per period. The borrowing rate, r^b , is equal to the risk free rate, which is assumed to be zero. We assume that initially there are $m = 10$ stocks of the bank owned by the manager. Finally, we assume that the costs of financial distress are equivalent to the initial capital provided by the manager, E_o .¹¹

4.1 Debt with Clawback Provision

We first solve the maximization problem for the case in which the junior debt includes a clawback provision. The evolution of the financial situation of the bank through time is presented in Figure 1. In Panel A we present the case in which conversion takes place at time $t = 1$; in Panel B, we present the situation where, forever reason, the clawback provision is not exercised by the bank at time $t = 1$. The nodes of the

¹¹ $c = 1$.

binomial trees correspond to the book value of the loans of the bank, which emphasizes that the evolution of loans value is the driving determinant of the financial position of the bank in our model. At each node of the trees, we present the pro forma balance sheets of the bank at both, market value and book value. It should be noted that the value of the assets and liabilities of the bank at time $t = 2$ is path dependent when conversion has taken place at time $t = 1$. Specifically, at node D in Panel A, the market value of equity and debt depends on whether there was a high value (node A) or low value (node B) realization of cash flows at time $t = 1$. For the former case, the path through the tree was *up-down* (ud) and there was no conversion, so there was neither a reduction in junior debt nor an equity issuance. For the later case, the path was *down-up* (du) and, according to the assumptions of our model, some individuals defaulted in the payment of their loans, situation that induced a reduction of the capital adequacy ratio of the bank below \underline{CAR} , triggering the partial redemption of the bank's junior debt with the corresponding issuance of new equity. So the value of debt changes and, since there are new equity holders, so does the expected value for old equity holders (the manager of the bank). Accordingly, in nodes B , D , and E we present the value of the equity ownership for both new equity holders - E_{new} - and old equity holders - E_{old} -.

At time $t = 0$, for the above parameters, the solution to the program (2) gives an optimal supply of loans of $L = 650$ ($N^* = 13$ loans of $l = 50$ each) and an optimal amount of junior debt of $B^* = 300$. Given the value of the assets in place and the demand for deposits, the manager provides her whole wealth as the initial equity of the bank - $E_0 = 150$ -, and the initial CAR of the bank at book value is 20%.¹²

At time $t = 1$, the option to exercise the clawback provision expires. It is clear that after a high value realization of cash flows (situation that arises from a good behavior of loan payments), the manager has no incentives to (partially) call the bank's junior debt. By doing so, she would be diluting her ownership - from which she obtains private

¹²In fact, in the maximization problem the restrictions related to the wealth of the manager and to the initial capital requirements are binding.

benefits -, and sharing the upside value of her shares with new equity holders. Since once in node A the probability of default in the bank's junior debt is zero, there is no benefit for her in terms of a reduced expected costs of financial distress from calling. Furthermore, the CAR of the bank at this point in time is higher than \underline{CAR} , so even if there was a trigger mechanism for debt conversion, it would not be activated in this case. After a low realization of cash flows, however, the situation of the bank is quite different. There is a strong reduction in both the book and equity value of the assets of the bank arising from the default of a fraction d of its portfolio of loans. Under these circumstances, the CAR of the bank is drastically reduced and if no action is taken, the capital adequacy ratio falls under the minimum \underline{CAR} . This shown in Panel B of Figure 1. If there is no conversion, the CAR falls to 7.12% at book value and to 9.02% at market value. The reduction in the capital ratio of the bank is driven by a strong reduction in the value of equity, which falls from 162.10 to 58.64. On the contrary, if conversion does take place, it can be seen in Panel A that the amount of outstanding junior debt is reduced to 210 and the value of the manager's shares is reduced to $E_{old} = 50.37$. The reduction in the amount of outstanding debt it is financed by an equity issuance. Since initially there were $m = 10$ shares, the unit price of shares is 5.037 and 17.88 new shares are issued, so the total value to the new equity holders is $E_{new} = 90$. As can be seen in Figure 1, the partial redemption of 30% of the junior debt increases the value of the equity of the firm from $E^d = E_{old} = 58.64$ when there is no redemption at time $t = 1$ to $E^d = E_{old} + E_{new} = 50.37 + 90 = 140.37$. This in turn increases the bank's CAR from 9,02% to 21.58% when measured at market value. Analogously, the CAR measured at book value increases from 7.12% to 21.05%. In any case, the bank's CAR after partial redemption of the junior debt is higher than the minimum capital adequacy ratio. Furthermore, the probability of failing in the payment of the remaining junior debt is zero.

Regarding the participation constraints, it is easy to check that the expected pay to

bondholders, given by $p(B^*) + (1-p) \left[(1-\gamma)B^* + \frac{\gamma B^*}{E^d - \gamma B^*} E^d \right] = 300 = B^*$, so bondholder are willing to provide funds. With respect to the manager of the bank, it should be noted that the investing in the bank represents a positive present value project, since the expected payoff of providing the initial capital requirement of $E_0 = 150$ is less than the expected payoff of equity given by $p^2 E^{uu} + p(1-p)(E^{ud} + E^{du}) + (1-p)^2 E^{dd} = 160.44$, even if the private benefits of control are not considered. Considering the private benefits of control and that there no expected costs of financial distress once redemption has taken place, the expected utility of the manager given by $E[\tilde{W} + (1-\alpha)\psi\tilde{S}] = 194.29$.

Discussion

As discussed before, the (partial) redemption of the bank's junior debt at time $t = 1$ after a low value realization of cash flows can recapitalize the bank and move its capital structure to an equity over assets ratio that complies with the minimum *CAR* required by the economic authority. We have not discussed so far the mechanism through which the junior long term debt is either converted into equity or redeemed by the issuing bank when the trigger is breached. For instance, it seems straightforward to define the trigger in terms of the bank's *CAR*, whether measured at book value or at market value. However, Sundaresan and Wang (2010) argue that an equilibrium based on contingent capital issued by banking institutions might not be feasible if conversion is triggered by stock price falling below a given threshold. This situation is know as the *trigger problem*. Prescott (2011) claims that the weak point of contingent capital is the trigger because conversion might occur when it is not desired.

If market prices or accounting number cannot be manipulated by the bank management, it seems to be clear that that the bank's *CAR* could be used as a trigger. In our model, however, conversion will occur voluntarily after low value realization of cash flows if the costs of financial distress, which are imposed on the bank manager,

are high enough. This can be seen in Figure 1. In Panel A, if conversion takes place after a low value realization of cash flows in node B, the market value of the manager's ownership would be $E_{old} = 50.37$. In Panel B, if the managers decides not to convert in node B, the market value of her ownership of the bank would be $E_{old} = 58.64$. However, in the situation presented in Panel B, there is an increased probability that the bank will default in its junior long term debt, which in turn would impose costs of financial distress on the manager. In fact, from $t = 0$ to $t = 1$ the probability of distress increases from $(1 - p)^2$ to $(1 - p)$. Given the parameters of the model, this means that the *ex ante* probability of distress has increased from 4% to an *ex post* probability of distress of 20%. Accordingly, the expected payoff for the manager of not converting is $E_{old} - (1 - p)cE_0 = 28.64$. So the expected payoff from converting is higher than the expected payoff of no converting. If we also consider the private benefits of control, the expected utility of converting is $E_{old} + (1 - \gamma)\psi\tilde{S} = 73.13$, while the expected utility of not converting is $E_{old} - (1 - p)cE_0 + p\psi\tilde{S} = 55.572$. Therefore, the manager will prefer to partially redeem its junior long term debt and voluntary conversion takes place.

4.2 Straight Debt

For completeness, the solution to the manager's maximization problem when the bank's junior debt corresponds to straight debt is presented in Figure 2. In this case, the manager chooses to offer $N^* = 9$ loans, for a total supply of loans of $L = 450$, and takes debt for $B^* = 102.4$. The initial CAR of the bank at book value is 26.84% and the manger provides initial equity $E_0 = 147.6$. The computations through the nodes of the tree are analogous to those in Figure 1. In this case, however, the value of the bank securities are, as expected, path independent, given that there is no possibility of conversion at time $t = 1$.

Discussion

When the bank's junior debt corresponds to straight debt, the amount of debt taken by the bank is significantly smaller than in the previous case. Given the characteristics of the pool of potential borrowers, the manager chooses a smaller debt in order to avoid the possibility of falling into financial distress. In particular, for the actual parametrization of the model, junior debt can always be repaid.

With straight debt, the *CAR* of the bank falls below the minimum required by the economic authority after the realization of low cash flows at time $t = 1$. In this case, the traditional recapitalization problem arises.

5 Conclusions

In this paper, we argue that IPOCs role of reducing financial distress in the corporate sector may be a viable tool in the financial sector. On the basis of a very simple equilibrium model, we show that a clawback provision in a bank's junior debt can solve the so called trigger problem of contingent capital if financial distress is costly enough. In such case, voluntary conversion will take place after the realization of low cash flows induced by a poor payment behavior on the bank portfolio of loans. In this sense, an IPOC-like security is a critical tool of risk management because they help solve the dilution problem of contingent capital and the debt overhang problem can be resolved effectively with market discipline. More importantly, we illustrate that the conversion of debt into equity as a risk management tool has significant implications for the supply of loans and the optimal debt that a firm is willing to hold on its balance sheet. Our analysis recognizes that the supply of loans, the amount of debt along with the amount of debt converted into equity, γ , is an endogenous decision that impacts the expected utility of managers which has an impact on the willingness and ability to convert the clawback on the outstanding bonds. This illustrates that current contingent

capital plans being considered by the banking regulators has consequences for the lending behavior and optimal capital structure of the banking system. Our position is that policy recommendations to relieve the financial distress of a banking institution should be balanced with the welfare effects that are implicit in the contract design and policy recommendations of the contingent capital recommendations. One such policy implication is the mandatory triggers based upon industry and firm levels of capitalization which imposes equity dilution upon the firm and an unknown impact on the supply of lending in the banking industry.

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Table 1: Balance sheet of the bank after high value realization of cash flows

Loans	L	Deposits	D_0
Assets in Place	A_0	Debt	B_0
		Equity	$L + A_0 - D_0 - B_0$
Total Assets	$L + A_0$	Total Liabilities	$L + A_0$

Table 2: Balance sheet of the bank after low value realization of cash flows

Loans	Ld	Deposits	D_0
Assets in Place	A_0	Debt	B_0
		Equity	$Ld + A_0 - D_0 - B_0$
Total Assets	$Ld + A_0$	Total Liabilities	$Ld + A_0$

Figure 1: Panel A

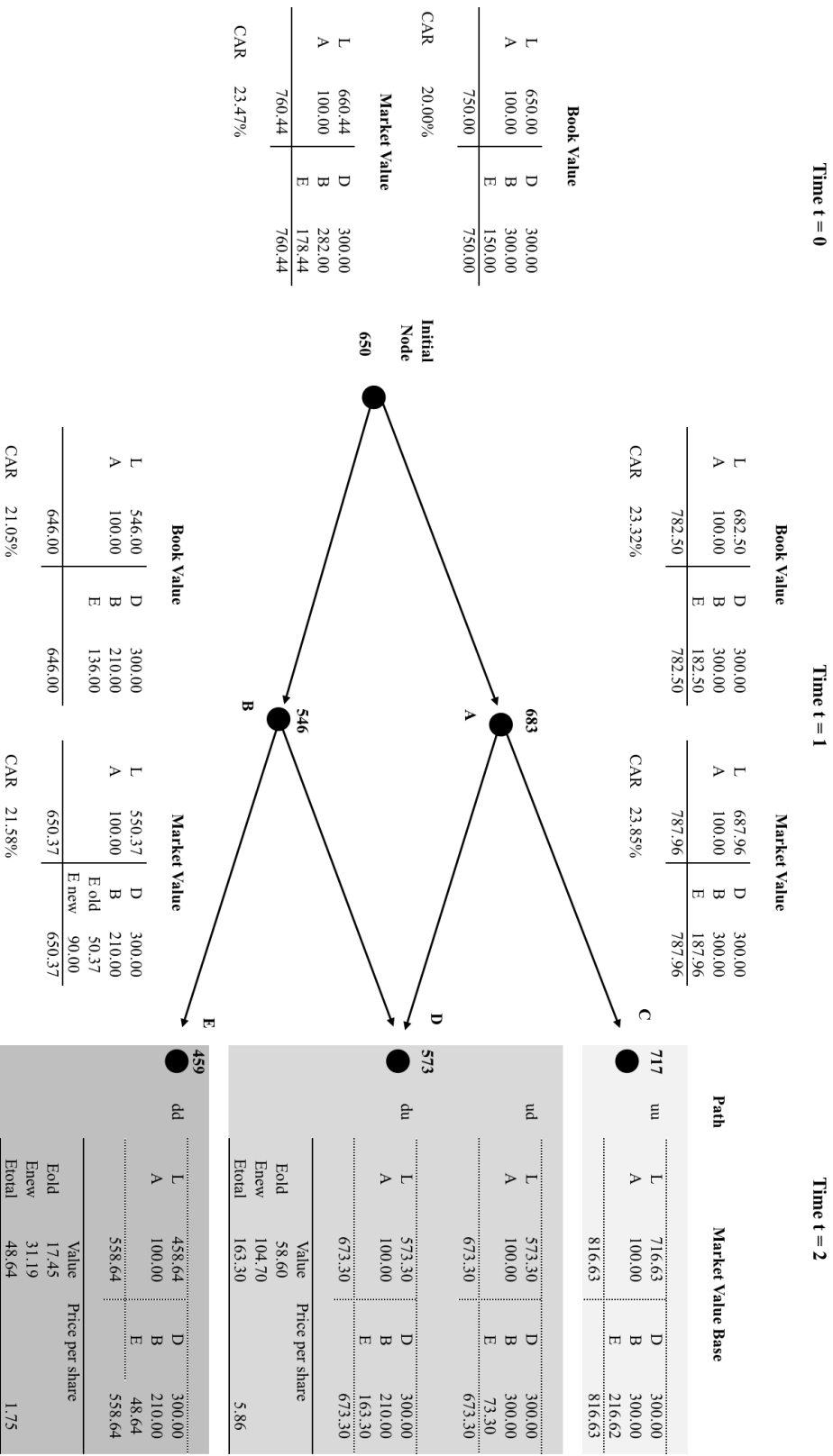


Figure 1: Panel B

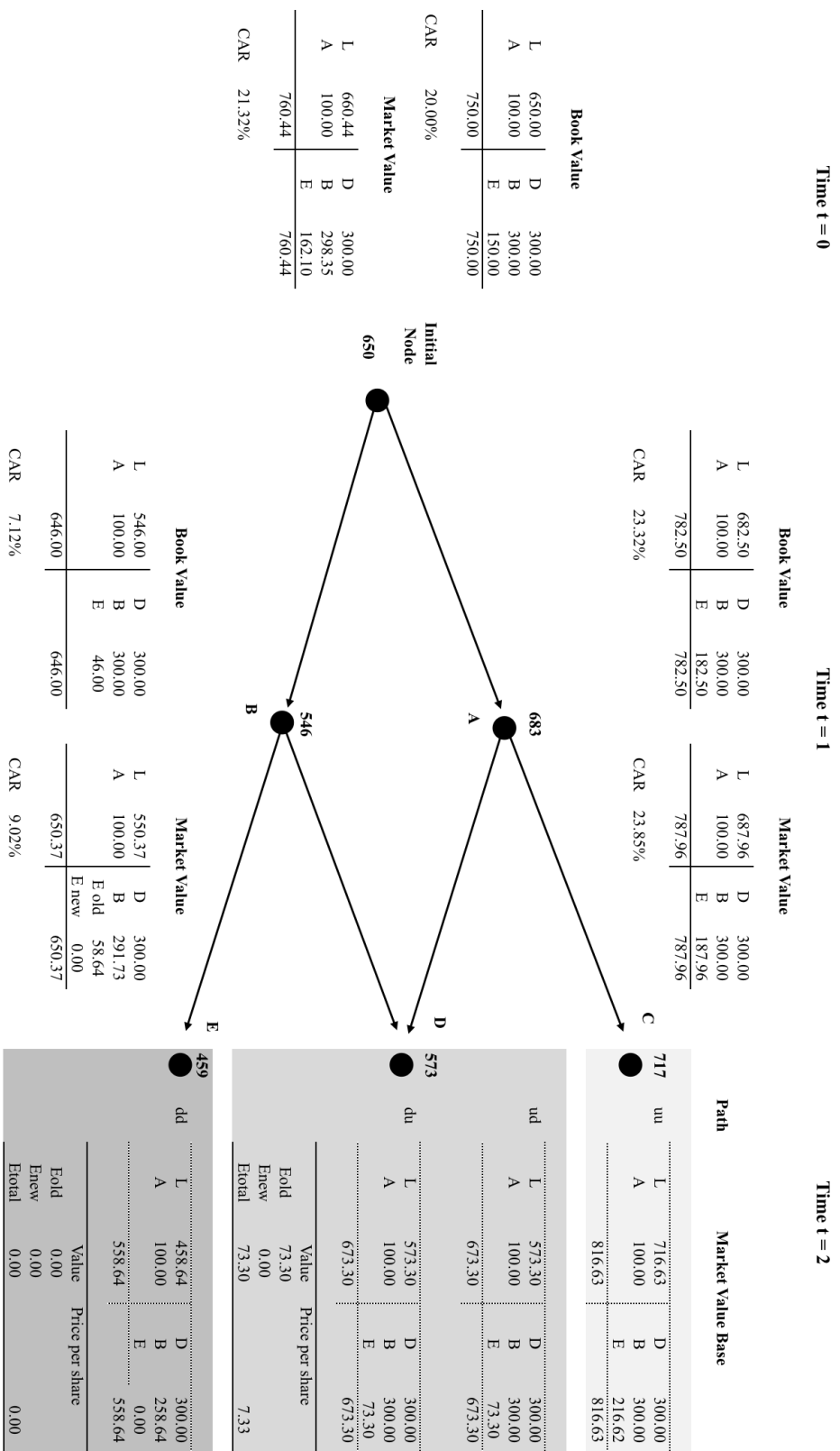


Figure 2

