A Note on Bank Default Risk and Delivery Channel Strategy under Deposit Insurance Fund Protection

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Abstract

Increasing investment in human resource relative to information technology system in retail banking delivery channels increases the optimal bank interest margin and decreases the default risk in the bank’s equity returns during a financial crisis. Raising the regulatory barrier inducing a wealth transfer from shareholders to the Federal Deposit Insurance Corporation reinforces both the effects above. Human resource investment with regulatory deposit insurance fund protection as such make the distressed bank more prudent to risk-taking, thereby contributing to the stability of the banking system.

Keywords: barrier option, FDIC, delivery channel choice

1. Introduction

The banking industry is experiencing a renewed focus on retail banking, a trend often attributed to the stability and profitability of retail activities (Hirtle and Stiroh, 2007). This note discusses one recent trend of the return to retail banking during a financial crisis and places it in the larger context of alternative delivery channels and bank regulation. Alternative delivery channels in retail banking can be motivated based on an argument about human resource investment relative to information technology investment in the spirit of Harangus (2009) and Kondo (2010) (Note 1). Parallel to an increased importance of the return to retail banking, there has been an ongoing discussion about the role of deposit insurance fund protection to influence bank behavior and make banks more robust against financial shocks, i.e., to strengthen the soundness and stability of banks in the usual parlance of the Federal Deposit Insurance Corporation (FDIC). Bank regulation in retail banking can be motivated based on the deposit insurance fund protection under the Federal Deposit Insurance Corporation Improvement Act (Episcopos, 2008).

In this note, the barrier options theory of corporate security valuation is applied to the contingent claims of a regulated bank to address the problem of early bank closure during a financial crisis (Episcopos, 2008). The FDIC as a regulator/insurer of the bank owns a down-and-in call (DIC) option on the bank assets which can be balanced against the expected coverage cost. We show that, as the bank increases its human resource management relative to its information technology investment, the optimal bank interest margin is increased, and the default risk in the bank’s equity returns is reduced. Our findings are consistent with Harangus (2009): human capital may produce superior return performance and greater safety for the bank. In addition, the positive impact on the margin and the negative impact on the default risk are reinforced as the regulatory barrier increases. Our findings are supported by Episcopos (2008). In conclusion, human resource management and deposit insurance fund protection as such make the bank less prone to risk-taking in retail banking activities, thereby contributing to the banking stability.

2. The Model

Consider a single-period \((t \in [0, 1])\) model of a banking firm. At \(t = 0\), the bank accepts \(D\) dollars of deposits. The bank provides depositors with a rate of return equal to the risk-free rate \(R_o\). Equity capital \(K\) held by the bank
is tied by regulation to be a fixed proportion $q$ of the bank’s deposits $K \geq qD$ where $q$ is the required capital-to-deposits ratio. Loan demand is a function of the loan rate, $L(R_L)$ with the condition of $\partial L / \partial R_L < 0$. This condition implies that the bank exercises some monopoly power in its loan market (Mukuddem-Petersen et al., 2008). The bank holds liquid asset $B$ that earns the security-market interest rate of $R$. When the capital requirement constraint is binding, the bank’s balance-sheet constraint at $t = 0$ is

$$L + B = D + K = K\left(\frac{1}{q} + 1\right) \tag{1}$$

The bank’s objective is to set $R_L$ to maximize the market value of a barrier option function (Brockman and Turtle, 2003) defined in terms of profits, subject to Eq. (1). In this context, the market value of the bank’s equity $S$ can be written as (Note 2):

$$S = \left[VN(d_1) - Ze^{-\delta}N(d_2)\right] - \left[V\left(\frac{H}{V}\right)^{2\eta}N(b_1) - Ze^{-\delta}\left(\frac{H}{V}\right)^{2\eta+2}N(b_2)\right] \tag{2}$$

where

$$V = (1 + R_L)L \text{ with } dV = \mu V dt + \sigma V dW$$

$$Z = \frac{(1 + R_D)K}{q} + cL + F(c) - [(1 + R)[K\left(\frac{1}{q} + 1\right)] - L]$$

$$\delta = R - R_D$$

$$d_1 = \frac{1}{\sigma}\left(\ln \frac{V}{Z} + \delta + \frac{\sigma^2}{2}\right)$$

$$d_2 = d_1 - \sigma$$

$$H = \alpha Z \text{, } \eta = \frac{\delta}{\sigma^2} + \frac{1}{2}$$

$$b_1 = \frac{1}{\sigma}\left(\ln \frac{H_2}{VZ} + \delta + \frac{\sigma^2}{2}\right)$$

$$b_2 = b_1 - \sigma$$

In Eq. (2), $V$ is the value of loan repayments at $t = 1$ with an instantaneous drift $\mu$ and instantaneous volatility $\sigma$. A standard Wiener process is $W$. $V$ is then treated as an underlying asset in the down-and-out call (DOC) valuation. $Z$ is defined as the net-obligation payments between the cost payments and the repayments from the liquid-asset investment at $t = 1$. The cost payments includes the payments to depositors $(1 + R_D)D$, the administrative cost of loans $cL$ where $c$ is the marginal cost, and the fixed cost $F(c)$. The fixed cost function is specified as a function of the marginal administrative cost with the condition of $\partial F / \partial c < 0$. A backward technology related to investment in human resource management can be identified as a higher $c$ with a lower $F$, while an advanced technology related to investment in information technology management can be identified as a lower $c$ with a higher $F$. $\delta$ is the compounded riskless rate of the strike price $Z$ in the call option. $H$ is the value of the bank’s assets that triggers bankruptcy (this is the barrier on knock-out value of the bank). For tractability, it is assumed that the default barrier level $H$ is proportional to the bank’s net-obligation payments $Z$ by a barrier-to-debt ratio $\alpha$ ($H = \alpha Z$). $N(\cdot)$ is the standard normal cumulative distribution. The first term $[\cdot]$ on the right-hand side of Eq. (2) is recognized as the expected asset value and present value of the net-obligation payments using the standard call (SC) option view of the bank. The second term $[\cdot]$ is recognized as the value of a DIC option that is the different between a SC and a DOC option.
negatively to bankruptcy probability. In conclusion, it is shown that human capital investment and regulatory barrier as such contribute retail banking stability. One issue that has not been addressed is that the impact of different types of human resource management related to employee perceptions of human resource policies and work practices on bank performance is heterogeneous. Is it the case that the results of this paper also apply to the heterogeneous case? Such concerns are beyond the scope of this paper, and so are not addressed here. What this paper does demonstrate, however, is the important role played by human resource investment in affecting bank performance and regulation effectiveness of the banking system.

References


Notes

Note 1. It is well-recognized that retail banking technology choices of human resource management relative to information technology system management are related to relationship lending issues that we are silent on. See, for example, Cotugno and Stefanelli (2011) for relationship lending focusing on the benefits for banks.

Note 2. We follow Brockman and Turtle (2003) and simply our discussion by assuming a zero rebate upon failure.

Note 3. Brockman and Turtle (2003) present that the average barrier estimates by years (1989-1998) are from 0.5900 in 1993 to 0.8395 in 1990. In our numerical exercises, the various barrier levels are assumed to be from $\alpha = 0.5$ to $\alpha = 0.7$, consistent with the findings of Brockman and Turtle (2003).