Sofia Guo Econ 136 PSET 7

Sofia Guo; SID #3031996033

3/19/2019

1. Ratings

For S&P, the BBB bond rating and the BB rating are the difference between investment grade and non-investment grade, respectively. For Moody's, the difference between Baa and Ba is the investment grade (high quality) and non-investment grade (speculative), respectively.

2. Calculate the price of B bonds

Year	1	2	3	4	5
Marginal default probability (%)	5.16	6.05	5.01	3.83	2.89

We are given: $r_{rec} = 0.41$, $N = 5$, $C = 6$, $i = 1$, $Y = 0.04$

For calculating the price of a risky bond, we know from lecture that:

$$P = \sum_{t=1}^{N} \frac{S_t C + S_{t-1} Pr_t r_{rec}(100 + C)}{(1+r)^t} + \frac{100 S_N}{(1+r)^N}$$

where $S_t = \prod_{t=1}^{N}(1 - Pr_t)$ with $S_0 = 1$.

So we can plug in the marginal default probability P_t for each t to solve for the price of a 5 year bond:

$$\begin{aligned} P &= \sum_{t=1}^{N} \frac{S_t C + S_{t-1} Pr_t r_{rec}(100 + C)}{(1+r)^t} + \frac{100 S_N}{(1+r)^N} \\ &= \sum_{t=1}^{5} \frac{S_t * 6 + S_{t-1} Pr_t * 0.41(106)}{(1.04)^t} + \frac{100 S_5}{(1.04)^5} \end{aligned}$$

We calculate:

$$\begin{aligned} S_1 &= (1 - P_1) = 1 - 0.0516 = 0.9484 \\ S_2 &= (1 - P_2) = 1 - 0.0605 = 0.9395 \\ S_3 &= (1 - P_3) = 1 - 0.0501 = 0.9499 \\ S_4 &= (1 - P_4) = 1 - 0.0383 = 0.9617 \\ S_5 &= (1 - P_5) = 1 - 0.0289 = 0.9711 \end{aligned}$$

$$\Rightarrow = \sum_{t=1}^{5} \frac{S_t * 6 + S_{t-1} Pr_t * 43.46}{(1.04)^t} + 79.81734$$
$$= \frac{0.9484 * 6 + 1 * 0.0516 * 43.46}{(1.04)^1} +$$
$$\frac{0.9395 * 6 + 0.9484 * 0.0605 * 43.46}{(1.04)^2} +$$
$$\frac{0.9499 * 6 + 0.9395 * 0.0501 * 43.46}{(1.04)^3} +$$
$$\frac{0.9617 * 6 + 0.9499 * 0.0383 * 43.46}{(1.04)^4} +$$
$$\frac{0.9711 * 6 + 0.9617 * 0.0289 * 43.46}{(1.04)^5} + 79.81734$$

```
(0.9484*6 + 1*0.0516*43.46)/(1.04) +
(0.9395*6 + 0.9484* 0.0605*43.46)/(1.04^2) +
(0.9499*6 + 0.9395* 0.0501*43.46)/(1.04^3) +
(0.9617*6 + 0.9499* 0.0383*43.46)/(1.04^4) +
(0.9711*6 + 0.9617* 0.0289*43.46)/(1.04^5) + 79.81734
```

```
## [1] 113.9135
```

$\Rightarrow P = 113.91$

3. Merton model distance to default

Given the definition:

$$\frac{1}{\sigma} ln\left(\frac{V}{B}\right)$$

the "distance to default" is the absolute difference between the expected value of the asset and the value at which the entity who bought the asset is considered in default or unable to pay its debt. The reason why this applies to the definition is because the $\frac{V}{B}$ indicates the ratio of the asset value to the debt used to buy it; as long as the value of the asset is greater than the debt, the ratio remains above 1 and ensures that the natural log is not 0 or negative. One would like this "distance to default" to remain ≥ 0 because then the firm would retain solvency.

4. Joint account risky debt profile

5. Single account risky debt profile

6. Edgebrook Bank Closure

(a) All of the depositors' accounts were transferred to the Republic Bank of Chicago in Oak Brook, IL.

(b) The level of assets on March 31, 2015 was approximately $90.0 million.

(c) The level of deposits on March 31, 2015 was approximately $90.0 million.

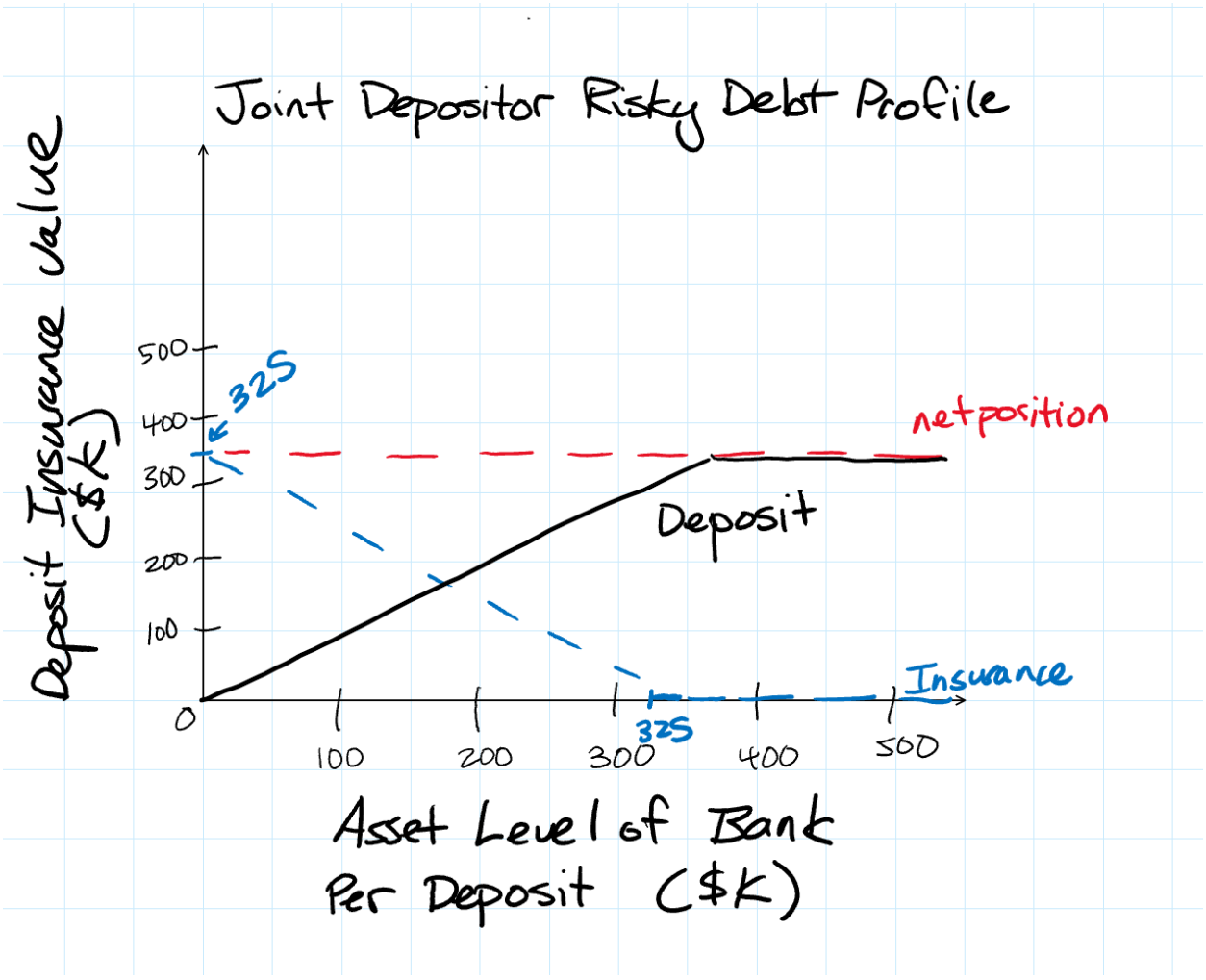
Joint Depositor Risky Debt Profile
Deposit Insurance Value ($K)
500
400
300
200
100
0
325
net position
Deposit
Insurance
325
100
200
300
400
500
Asset Level of Bank Per Deposit ($K)

Figure 1:

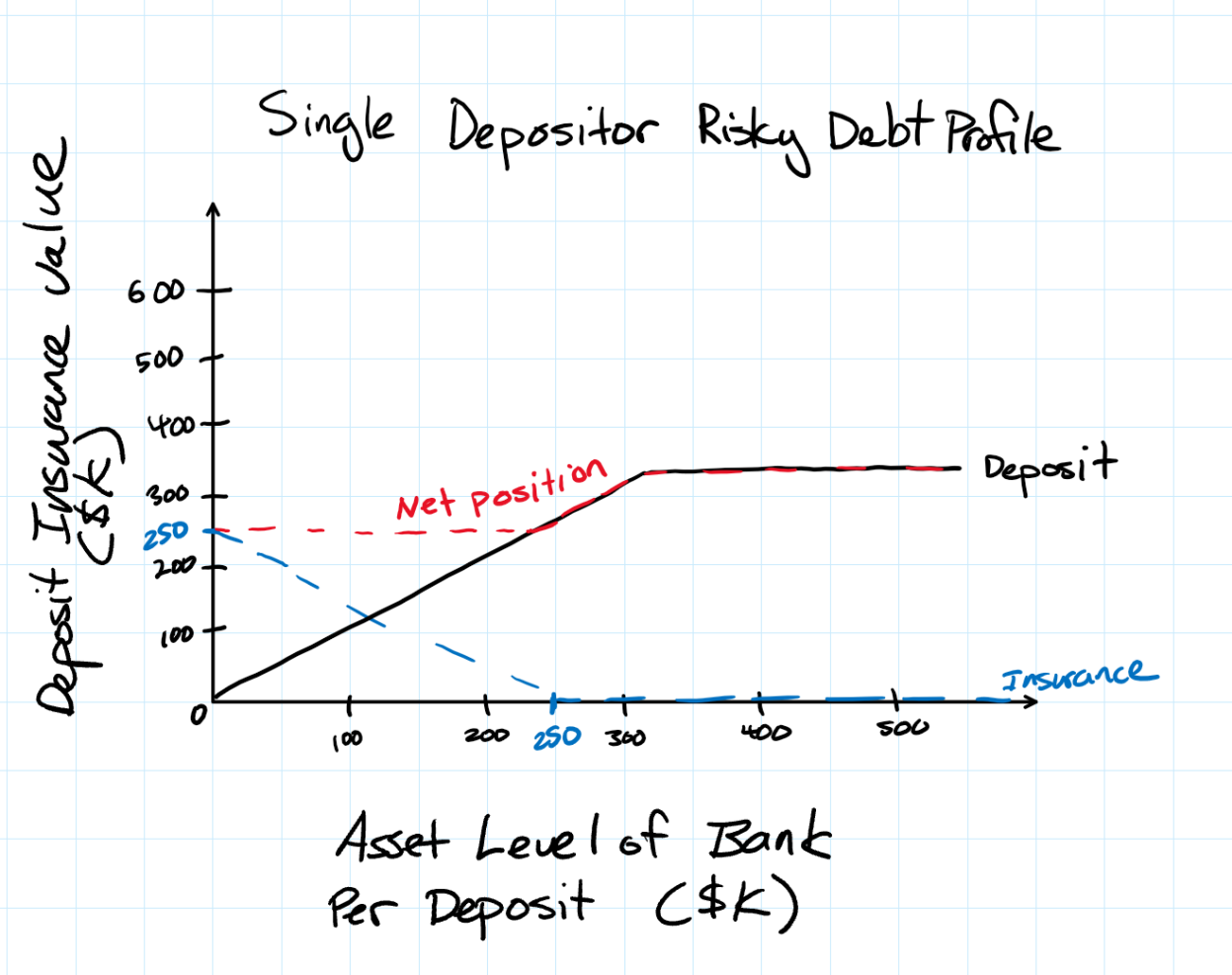
Single Depositor Risky Debt Profile
Deposit Insurance Value ($K)
600
500
400
300
250
200
100
0
Net position
Deposit
Insurance
100
200
250
300
400
500
Asset Level of Bank Per Deposit ($K)

Figure 2:

(d) Since Assets = Liability + Equity, the bank had $0 in equity because the assets were equal to the liabilities at $90 million dollars each.

(e) The cost to the Deposit Insurance Fund was $16.8 million.

(f) They chose it because it was the least costly resolution to purchasing all the deposits of Edgebrook compared to other alternatives.