Andreas Krause

Chapter 11.1.2

Exploiting informational advantage

- When interacting with customers repeatedly and having access to their account movements, banks can obtain additional information that other banks do not have access to.
- Such information can be soft information about how the company manages its finance, but also information about the ability of their management.
- Having access to this information gives a bank a competitive advantage over their competitors.
- We will see how banks will make use of this competitive advantage.

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Accumulating information

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Accumulating information

→ A key feature of relationship banking is that banks gain an informational advantage over their competitors.

- In relationship banking, information is accumulated over time through the repeated interaction with the company; banks therefore gain an advantage over competitors only over time. There is no informational advantage for new customers.
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  - Having the additional information is usually modelled as having more precise information on the risk of companies.
  - With more precise information on the risks, the bank can price loan more precisely and does not need to add a surcharge for them not knowing the true risks well. This would allow banks to charge lower loan rates.
- If a bank has an informational advantage, it should be able to make excess profits by exploiting this informational advantage. These profit would compensate banks for any additional costs they might have in obtaining this additional information.

→ We now need to model this precision of information banks obtain.

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- This allows banks to assess risks better

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Precision of information

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- We assume that banks obtain information about the risk of a company as a noisy signal. Such a signal gives them information about the risk, but this information is not perfect.
- Without having established a relationship, the bank obtains a signal which has some degree of uncertainty.
- A bank that has established a relationship with the company also obtains a signal about the risks, but this signal is more precise in that uncertainty is smaller.
- Companies are only concerned about the loan rate they obtain, thus the bank offering the lower loan rate will provide the loan to the company.
- Company require loans over two time periods, but can change the bank after one time period if the other bank offers a better loan rate.

→ Banks will now use their signal to determine the loan rates in each time period.

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Precision of information

- Banks receive a noisy signal on the risk of a company

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Precision of information

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- If the bank has not lent to the company previously, the uncertainty is σ_1^2

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Loan rates in period 2

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- Banks choose the loan rate such they maximize their profits. We therefore need to solve the first order condition for the existing bank as well as the new bank.

⇒ Solving the first order condition, we get the loan rate as given in the *formula*.

· *Formula*

→ We can use these implicitly defined loan rates (the loan rates are also in the probabilities) to obtain the profits of banks.

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Loan rates in period 2

- Banks provide the loan if they are offering the lower loan rate

- Existing bank: $\hat{\Pi}_B^2 = \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)\left(\qquad \right)$
  New bank: $\Pi_B^2 = \left(1 - \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)\right) \qquad)$

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- Existing bank: $\hat{\Pi}_B^2 = \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)\left(\left(1+\hat{r}_L^2\right)L\right)$
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- Maximizing profits: $\frac{\partial \hat{\Pi}_B^2}{\partial\left(1+\hat{r}_L^2\right)} = 0$

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$$1+r_L^2 = \frac{1+r_D}{\pi_2} + \frac{1-\text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)}{\frac{\partial \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$$

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- The probability of the loan being repaid is given by the risk assessment of the bank, based on the signal they have received.
- If they provide the loans, banks have to finance this using deposits, which will also have to be repaid.

▶ *Formula*

· *Formula*

▶
- Banks choose the loan rate such they maximize their profits. We therefore need to solve the first order condition for the existing bank
- as well as the new bank.

⇒ Solving the first order condition, we get the loan rate as given in the *formula*.

· *Formula*

→ We can use these implicitly defined loan rates (the loan rates are also in the probabilities) to obtain the profits of banks.

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Bank profits

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Bank profits

→ Having determined the loan rate in time period 2, we can now obtain the bank profits in that time period.

- Inserting the loan rates and neglecting the deposit rates, we can obtain the profits of the existing and new banks.
- *Formula*
-
  - We can now turn to the bank profits including time period 1, where there is only one type of bank as both banks are new banks. Again, the bank offering the lower loan rate will obtain the loan for the first time period.
  - This bank will then become the existing bank in time period 2 and make the relevant profits as outlined above.
  - If the bank does not offer the lower loan rate, it will not provide the loan and in the second time period remain the new bank, making the profits as outlined above.
  - In both cases, a loan in the second time period is only given if the loan is repaid after the first time period as otherwise the company would default.
- *Formula*

→ We can now determine the loan rate in time period 1.

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Bank profits

- Existing bank: $\hat{\Pi}_B^2 = \frac{\text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)^2}{\frac{\partial \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)}{\partial\left(1+r_L^2\right)}} L$

  New bank: $\Pi_B^2 = \frac{\left(1-\text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)\right)^2}{\frac{\partial \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)}{\partial\left(1+r_L^2\right)}} L$

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- In time period 1, the bank offering the lower loan rate provides the loan
- $\Pi_B^1 = \left(1 - \text{Prob}\left(\hat{r}_L^1 < r_L^1\right)\right)\left(\pi_1\left(1 + r_L^1\right) L - \left(1 + r_D\right) L + \qquad\right)$

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Bank profits

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- In time period 1, the bank offering the lower loan rate provides the loan and then becomes the initial bank

- $\Pi_B^1 = \left(1 - \text{Prob}\left(\hat{r}_L^1 < r_L^1\right)\right)\left(\pi_1\left(1 + r_L^1\right) L - \left(1 + r_D\right) L + \quad \Pi_B^2\right)$

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Bank profits

- Existing bank: $\hat{\Pi}_B^2 = \frac{\text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)^2}{\frac{\partial \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)}{\partial\left(1+r_L^2\right)}} L$

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- In time period 1, the bank offering the lower loan rate provides the loan and then becomes the initial bank, otherwise it becomes the new bank

- $\Pi_B^1 = \left(1 - \text{Prob}\left(\hat{r}_L^1 < r_L^1\right)\right)\left(\pi_1\left(1+r_L^1\right)L - \left(1+r_D\right)L + \Pi_B^2\right) + \text{Prob}\left(\hat{r}_L^1 < r_L^1\right) \hat{\Pi}_B^2$

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Bank profits

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- In time period 1, the bank offering the lower loan rate provides the loan and then becomes the initial bank, otherwise it becomes the new bank, where loans are only given if the company was successful
- $\Pi_B^1 = \left(1 - \text{Prob}\left(\hat{r}_L^1 < r_L^1\right)\right)\left(\pi_1\left(1+r_L^1\right)L - \left(1+r_D\right)L + \pi_1 \Pi_B^2\right) + \text{Prob}\left(\hat{r}_L^1 < r_L^1\right)\pi_1 \hat{\Pi}_B^2$

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Bank profits

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Bank profits

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Bank profits

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- *Formula*

→ We can now determine the loan rate in time period 1.

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Loan rate in time period 1

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Loan rate in time period 1

→ Using the profits that banks obtain across both time periods, we can now determine the optimal loan rate in time period 1.

- If we assume that banks are initially identical, then the likelihood of each quoting the lower loan rate is equal. While they receive different signals, who receives the more favourable signal will be random, hence they are equally likely to offer the better loan rate.
- If we have perfect competition between banks, then over the two time periods, banks would make no profits.

⇒ Solving from this condition, we obtain the loan rate that is quoted in the first time period.

→ Having obtained the loan rates in both time periods, we can now compare these.

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Loan rate in time period 1

- Initially banks are identical: Prob $\left(\hat{r}_L^1 < r_L^1\right) = \frac{1}{2}$

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Loan rate in time period 1

- Initially banks are identical: Prob $\left(\hat{r}_L^1 < r_L^1\right) = \frac{1}{2}$
- Perfect competition requires $\Pi_B^1 = 0$

$$\Rightarrow 1 + r_L^1 = \frac{1+r_D}{\pi_1} - \frac{1-2\text{Prob}\left(\hat{r}_L^2 < r_L^2\right)\left(1-\text{Prob}\left(\hat{r}_L^2 < r_L^2\right)\right)}{2\frac{\partial \text{Prob}\left(\hat{r}_L^2 \leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$$

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Loan rate in time period 1

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Loan rate in time period 1

→ Using the profits that banks obtain across both time periods, we can now determine the optimal loan rate in time period 1.

- If we assume that banks are initially identical, then the likelihood of each quoting the lower loan rate is equal. While they receive different signals, who receives the more favourable signal will be random, hence they are equally likely to offer the better loan rate.
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Expected loan rates

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Expected loan rates

→ Of course, the loan rates will depend on the signals received. It is wherefore that we need to take expectations about the loan rates that are applicable.

- Using results from statistics, we can now obtain these expected loan rates in both time periods.
- *Formula*
- Comparing these two expressions, we can show that the expected loan rate in time period 1 is lower than in time period 2.
-
  - Existing banks make profits in time period 2 due to their informational advantage. Existing banks know that due to the improved information, they will on average offer better loan rates than new banks and hence will increase the loan rate, thereby increasing the chances of new banks to offer the best loan rate, but also increasing their own profits. The loan rate offered will be the optimal trade-off between these two effects, giving existing banks profits.
  - As they are competing, existing banks will use these profits to attract companies in the first time period. Banks anticipate that in time period 2 they would make a profit if providing the loan in time period 1, thus will lower the loan rate to attract companies. Due to competition, they will lower the loan rate so far that in the first time period they make a loss, compensated by the profits in time period 2.
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  - New banks will not provide loan in time period 2 often due to them having less information and therefore quoting a higher price on average. Only if the signal they receive suggests a low risk, will their loan rate be sufficiently low.
  - This implies that as a new bank there are very little profits to be made in time period 2, thus the competition for the company in time period 1 to become the existing bank in time period 2.

→ We thus see that while existing banks make excess profits due to relationship banking once they have accumulated information, they compete to attract companies in the first place and this erodes these excess profits across all time periods.

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Expected loan rates

- $\mathsf{E}\left[1+r_L^1\right] = (1+r_D)\left(\frac{1}{\pi}+\frac{\sigma_1^2}{\pi^3}\right) - \frac{1-2\mathsf{Prob}\left(\hat{r}_L^2<r_L^2\right)\left(1-\mathsf{Prob}\left(\hat{r}_L^2<r_L^2\right)\right)}{\frac{\partial\mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$

  $\mathsf{E}\left[1+r_L^2\right] = \frac{1+r_D}{\pi}\left(1+\frac{\sigma_2^2}{\pi^2}\right) + \frac{1-\mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\frac{\partial\mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$

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  $\mathsf{E}\left[1+r_L^2\right] = \frac{1+r_D}{\pi}\left(1+\frac{\sigma_2^2}{\pi^2}\right) + \frac{1-\mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\frac{\partial \mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$

- We find $\mathsf{E}\left[1+r_L^1\right] < \mathsf{E}\left[1+r_L^2\right]$

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  $\mathsf{E}\left[1+r_L^2\right] = \frac{1+r_D}{\pi}\left(1+\frac{\sigma_2^2}{\pi^2}\right) + \frac{1-\mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\frac{\partial \mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$
- We find $\mathsf{E}\left[1+r_L^1\right] < \mathsf{E}\left[1+r_L^2\right]$
- Banks make profits in time period 2 due to their informational advantage

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Expected loan rates

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Expected loan rates

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  $\mathsf{E}\left[1+r_L^2\right] = \frac{1+r_D}{\pi}\left(1+\frac{\sigma_2^2}{\pi^2}\right) + \frac{1-\mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\frac{\partial \mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$
- We find $\mathsf{E}\left[1+r_L^1\right] < \mathsf{E}\left[1+r_L^2\right]$
- Banks make profits in time period 2 due to their informational advantage, these profits are used to attract companies in time period 1

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Expected loan rates

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- Using results from statistics, we can now obtain these expected loan rates in both time periods.
- *Formula*
- Comparing these two expressions, we can show that the expected loan rate in time period 1 is lower than in time period 2.
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  - Existing banks make profits in time period 2 due to their informational advantage. Existing banks know that due to the improved information, they will on average offer better loan rates than new banks and hence will increase the loan rate, thereby increasing the chances of new banks to offer the best loan rate, but also increasing their own profits. The loan rate offered will be the optimal trade-off between these two effects, giving existing banks profits.
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→ We thus see that while existing banks make excess profits due to relationship banking once they have accumulated information, they compete to attract companies in the first place and this erodes these excess profits across all time periods.

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- $\mathsf{E}\left[1+r_L^1\right] = (1+r_D)\left(\frac{1}{\pi}+\frac{\sigma_1^2}{\pi^3}\right) - \frac{1-2\mathsf{Prob}\left(\hat{r}_L^2<r_L^2\right)\left(1-\mathsf{Prob}\left(\hat{r}_L^2<r_L^2\right)\right)}{\frac{\partial \mathsf{Prob}\left(\hat{r}_L^2\leq r_L^2\right)}{\partial\left(1+r_L^2\right)}}$

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- We find $\mathsf{E}\left[1+r_L^1\right] < \mathsf{E}\left[1+r_L^2\right]$
- Banks make profits in time period 2 due to their informational advantage, these profits are used to attract companies in time period 1
- Making profits as a new bank in time period 2 is rare as they need to obtain a very high signal to provide the loan

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→ Gaining an informational advantage over time will affect how loan rates evolve over time, even if the signal that banks obtain does not change.

- We have seen that banks are competing to attract companies in the first place and offer low loan rates to this effect, making introductory offers that induce losses for banks.
  - They recover these losses then from exploiting their informational advantage by increasing the loan rate once the relationship is established and the bank has obtained additional information.
- We thus see introductory loan rates for new customers that are very attractive and may be loss-making to banks.
  - These losses are subsequently recovered by increasing the loan rate. Companies are unlikely to obtain a better loan rate from other banks as they do not hold the same level of information and will therefore rarely be able to offer a better loan rate; companies are trapped with their existing bank, even though they are not quoting competitive loan rates.
- Relationship banking is most important where information is difficult to obtain without having detailed access to the company as will only be possible with repeated interactions with the company. Thus for companies where banks have to rely on much soft information, relationship banking will be particularly prominent and incerase in the loan rate especially pronounced.
- If more information can be accumulated through the relationship, banks will gain a larger informational advantage, increasing their future profits and will thus compete more to attract the company in the first place.
  - This will lead to a larger increase of loan rates once the relationship is established.

→ Relationship banking changes the nature of competition, banks compete to attract companies and then once they have gained the informational advantage over competitors, they will seek to recover their initial losses through less competitive loan rates.

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- Banks compete to enter relationships, which they then can exploit once they have obtained the informational advantage
- This leads to attractive initial loan rates

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