Andreas Krause

Credit rationing

- We often observe that borrowers apply for a loan and banks are not willing to grant a loan of that size, but happily approve a smaller loan at the same loan rate.
- We will explore the causes of such a situation, which is often referred to as credit rationing.

Equilibria in economics

- An equilibrium is usually a price and quantity at which markets clear: [illegible] demand and supply are equal.
- Such an equilibrium exists if the supply is increasing in price and demand decreasing.
- If demand or supply is not monotonous, market clearing might not exist, giving an excess demand or supply.
- The equilibrium would then be where the price setter maximizes its profits.

Equilibria in economics

→ Equilibrium is a key concept in economics; it represents the outcome that under conditions as set out in the assumptions should emerge.

- The common way an equilibrium is defined is that it is a price for a good at which the market clears.
  - Market clearing here means that the supply of the good by a seller or producer is the same as the demand of buyers.
- We know that such an equilibrium exists as long as the quantity supplied by the seller/producer is increasing in the price
  - and at the same time the quantity demanded by buyers is reducing in the price. There will be a point where these two lines intersect and markets clear.
- This requires that supply and demand are monotonously increasing and decreasing, respectively. If this does not happen, then these two lines might never cross and an equilibrium where markets clear cannot exist.
- If this were the case, the equilibrium would then be chosen by whoever is the price setter; it would choose the price which maximises its profits. This will not result in an equilibrium but will have an excess demand or excess supply, depending on who the price setter is. If there is excess demand, the demand would need to be rationed.

→ Such a situation would still be an equilibrium, although not one in which markets clear.

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Excess demand for loans

- It might be that companies apply for a loan, but are granted only a smaller loan.
- Even if offering a higher loan rate, they are not granted a larger loan.
- In this case we have excess demand by companies for loans.
- This is referred to as credit rationing.

Excess demand for loans

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- It is not uncommon for companies to apply for a loan and that when this loan is granted, the bank is not willing to provide a loan for the full size the company has applied for. banks might limit the size of the loan, and this is not because of restrictions banks face, for example from the size of deposits they have.
- Companies might offer a higher loan rate to induce banks to provide them with a larger loan, but this is not accepted by banks.
- We will therefore have excess demand for loans at the loan rate and banks will allocate only a fraction of the loan the company has applied for.
- The term used for this situation in this context is credit rationing.

→ We can now look at the causes of such credit rationing.

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Loan rates and repayments

- If investment outcomes are unknown, banks do not know how much of their loan is repaid
- A higher loan rate requires a higher investment outcome to repay the loan fully
- A higher loan rate therefore does not necessarily increase profits to the bank
- Banks will anticipate this relationship and might not be willing to lend as much as loan rates increase

Loan rates and repayments

→ It is commonly assumed that a higher price (loan rate) increases profits. But for loans, this is not always true.

- In most cases the outcomes of investments companies make are not known, the outcome itself might vary, but also the likelihood that the investment is successful and generates any outcome at all.
- If banks charge a higher loan rate, the total amount that needs to be repaid increases, which means in order to obtain a full loan repayment, a higher outcome is required.
- Therefore, a higher loan rate doe snot necessarily increase profits to the bank, it might mainly increase the default rate as the higher amount cannot be repaid in full.
- Banks will know that a higher loan rate will not necessarily increase profits. For this reason they might reduce the loan size as they increase the loan rate and maintain the same or higher profits as that smaller loan is more likely to be repaid.

→ We will see how this relationship between loan rates and loan repayment affects bank profits and leads to credit rationing.

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Chapter 7.1
The consequences of uncertain outcomes

→ The model we are going to discuss is based on Chapter 7.1 of the book 'Theoretical Foundations of Banking'. A more detailed description of the model, additional steps for its solution, and a more in-depth discussion of results can be found there.

Discussion of model results

- A higher loan rate makes the repayment of the full loan less likely $\Rightarrow$ upward-sloping supply function
- If the loan demand is sufficiently high, this demand cannot be met and credit rationing occurs
- If companies anticipate credit rationing, would they apply for larger loans than they need?
- This would not alleviate the problem as banks have a maximum loan size they are willing to give, regardless of the size the company seeks $\Rightarrow$ vertical supply function

Discussion of model results

→ Now that we have derived the main results of the model, as far as relevant for us, we will briefly discuss some implications as well as limitations of this model. This will allow us to interpret the model in its context of the initial problem and enables us to apply it appropriately in a realistic context.

- Higher loan rates implies that a larger amount needs to be repaid by the company, which is less likely to occur.
  - This property causes the supply function to be non-monotonous.
- This non-monotony of the supply allows for high loan demands to cause credit rationing as the demand does not meet the supply before the bank reaches its maximum profits.
- If companies think that loans will be rationed, would it be rational for them to just apply for a larger loan and then hope that after rationing they will obtain the loan they originally wanted to obtain?
- Banks have a maximum loan size they are willing to give, the size of loan the company seeks is not relevant in that decision.
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→ Uncertain outcomes of investment are not the only problems bank face when providing loans. There are other issues that can also lead to credit rationing.

Discussion of model results

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? If companies anticipate credit rationing, would they apply for larger loans than they need?

! This would not alleviate the problem as banks have a maximum loan size they are willing to give, regardless of the size the company seeks: a general feature of limited resources where these are allocated through rationing

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  - This property causes the supply function to be non-monotonous.
- This non-monotony of the supply allows for high loan demands to cause credit rationing as the demand does not meet the supply before the bank reaches its maximum profits.
- If companies think that loans will be rationed, would it be rational for them to just apply for a larger loan and then hope that after rationing they will obtain the loan they originally wanted to obtain?
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  - It is not that they can only meet a fraction of the demand, they do not want to grant larger loans.

→ Uncertain outcomes of investment are not the only problems bank face when providing loans. There are other issues that can also lead to credit rationing.

Discussion of model results

- A higher loan rate makes the repayment of the full loan less likely, this induces a non-monotonous supply function
- If the loan demand is sufficiently high, this demand cannot be met and credit rationing occurs
- ? If companies anticipate credit rationing, would they apply for larger loans than they need?
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Decisions by companies

- Companies obtaining loans decide on how much risk they take with their investments
- Banks will always prefer companies to take lower risk (unless compensated for the decrease of the company assets)
- Banks will anticipate this moral hazard and how it affect their profits
- This assessment will then determine how much they are willing to lend

Decisions by companies

→ Companies can also decide how to use the funds they obtain from the bank. They might use it in a different way the banks would like the company to use the loan, for example by taking larger risks than the bank is comfortable with.

- Banks cannot directly affect the risks companies take, while agreements can be made, these are easily circumvented, hence banks would need to provide incentives to companies to choose investments they want companies to take.
-
  - Banks will normally prefer companies to take lower risks as that increases the repayment of the loan, assuming the loan can be repaid from the return on the low-risk investment.
  - This can give rise to a moral hazard in that the bank would like to the company to take lower risks, but the company finds it optimal to choose investments with higher risks.
- Banks will know that this moral hazard exists and will take this into account when granting loans.
- Based on these considerations, banks will make their lending decisions and we will see how this can give rise to credit rationing.

→ We can now use s simple model of moral hazard to obtain an equilibrium that includes credit rationing.

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Chapter 7.2
Credit rationing caused by moral hazard

→ The model we are going to discuss is based on Chapter 9.2 of the book 'Theoretical Foundations of Banking'. A more detailed description of the model, additional steps for its solution, and a more in-depth discussion of results can be found there.

Discussion of model results

- Banks use the loan size to induce companies to reduce the risks they are taking
- For intermediate loan demand this can lead to credit rationing
- Would providing a collateral alleviate the problem of credit rationing?
- Losing the collateral if defaulting, provides additional incentives to reduce risks
- But might exacerbate credit rationing

Discussion of model results

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- Limiting the size of the loans, the bank will provide incentives to the company to reduce the risks they are taking. Smaller loans imply larger equity and in case the investment is not successful a larger loss to the company, inducing them to reduce the risks they are taking.
- While for low and high loan demand this has no effect on the type of equilibrium, for intermediate loans, this might lead to credit rationing.
- Collateral can be used to reduce the risks to banks, how could this affect the problem of credit rationing?
-
  - As unsuccessful investments lead to a loss of the collateral, so this is equivalent of having more equity, leading companies to reduce risks more.
  - This will increase the area in which the low-risk investment is chosen and may lead to market clearing. However, it only shifts thresholds, doe snot eliminate them.

→ We have established that moral hazard can induce credit rationing as banks seek to ensure companies are making low-risk investments.

Discussion of model results

- Banks use the loan size to induce companies to reduce the risks they are taking
- For intermediate loan demand this can lead to credit rationing

? Would providing a collateral alleviate the problem of credit rationing?

! Losing the collateral if defaulting, provides additional incentives to reduce risks: this might avoid credit rationing

Discussion of model results

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Summary of key results

- Credit rationing can occur if the demand for loans by a company is sufficiently high and the supply of bank loans is not monotonous
- Credit rationing occurs due to higher loan rates inducing more risky behaviour increasing the risk of default due to higher repayments
- Companies with good prospects seeking loans for additional investments may be subject to credit rationing if they demand large loans

Summary of key results

→ We can now summarize the key results we have obtained about the role of collateral in lending.

- The key property is that uncertainty in outcomes of investments and moral hazard induce non-monotonous supply functions for loans. Combined with a high or moderately high loan demand, we can observe credit rationing.
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  - Higher loan rates induce more risky behaviour to recover the additional costs, which then results in higher default risk.
  - Higher loan rates also increase the total loan repayments, necessitating higher investment outcomes to repay the loan fully; consequently default rates will increase.
- Companies with good prospects will have high loan demands and are willing to pay a high loan rate. It is exactly these companies that might be subject to credit rationing due to their high demand; companies with a lower demand for loans, for example due to less profitable investment opportunities, might find it easier to obtain a loan of the full size..

→ Credit rationing is an equilibrium that emerges due to uncertainty in investment outcomes or moral hazard in investment decisions.

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- Credit rationing can occur if the demand for loans by a company is sufficiently high and the supply of bank loans is not monotonous
- Credit rationing occurs due to higher loan rates inducing more risky behaviour or increasing the risk of default due to higher repayments
- Companies with good prospects seeking loans for additional investments may be subject to credit rationing if they demand large loans

Summary of key results

→ We can now summarize the key results we have obtained about the role of collateral in lending.

- The key property is that uncertainty in outcomes of investments and moral hazard induce non-monotonous supply functions for loans. Combined with a high or moderately high loan demand, we can observe credit rationing.
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  - Higher loan rates induce more risky behaviour to recover the additional costs, which then results in higher default risk.
  - Higher loan rates also increase the total loan repayments, necessitating higher investment outcomes to repay the loan fully; consequently default rates will increase.
- Companies with good prospects will have high loan demands and are willing to pay a high loan rate. It is exactly these companies that might be subject to credit rationing due to their high demand; companies with a lower demand for loans, for example due to less profitable investment opportunities, might find it easier to obtain a loan of the full size..

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