Andreas Krause

Chapter 15.1

Investment in expertise

Outline

- Problem and model assumptions
- Buyer setting low price
- Buyer setting high price
- Optimal expertise
- Summary

- Problem and model assumptions
- Buyer setting low price
- Buyer setting high price
- Optimal expertise
- Summary

Trading expertise

Trading expertise

- In order to make profits from trading, investment banks need to invest into the expertise of their traders

Trading expertise

- In order to make profits from trading, investment banks need to invest into the expertise of their traders
- Trading profits of one investment bank are the losses of another investment bank

Trading expertise

- In order to make profits from trading, investment banks need to invest into the expertise of their traders
- Trading profits of one investment bank are the losses of another investment bank
- Investment banks are competing for profits through expertise

Trading expertise

- In order to make profits from trading, investment banks need to invest into the expertise of their traders
- Trading profits of one investment bank are the losses of another investment bank
- Investment banks are competing for profits through expertise

Signals for traders

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits
- Value of the security is V_H with probability π

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits
- Value of the security is V_H with probability π, or V_L otherwise

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits
- Value of the security is V_H with probability π, or V_L otherwise
- Traders receive a signal s that is accurate with $Prob\left(V_H|H\right) = Prob\left(V_L|L\right) = \rho_i \geq \pi$

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits
- Value of the security is V_H with probability π, or V_L otherwise
- Traders receive a signal s that is accurate with $Prob\left(V_H|H\right) = Prob\left(V_L|L\right) = \rho_i \geq \pi$
- Expertise is $e_i = \rho_i - \pi$

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits
- Value of the security is V_H with probability π, or V_L otherwise
- Traders receive a signal s that is accurate with $Prob\left(V_H|H\right) = Prob\left(V_L|L\right) = \rho_i \geq \pi$
- Expertise is $e_i = \rho_i - \pi$ and costs C_i to obtain

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits
- Value of the security is V_H with probability π, or V_L otherwise
- Traders receive a signal s that is accurate with $Prob\left(V_H|H\right) = Prob\left(V_L|L\right) = \rho_i \geq \pi$
- Expertise is $e_i = \rho_i - \pi$ and costs C_i to obtain
- Expertise is only available to sellers

Signals for traders

- Benefits of trading ΔV can be positive if diversification and hedging are considered, in addition of trading profits
- Value of the security is V_H with probability π, or V_L otherwise
- Traders receive a signal s that is accurate with $Prob\left(V_H|H\right) = Prob\left(V_L|L\right) = \rho_i \geq \pi$
- Expertise is $e_i = \rho_i - \pi$ and costs C_i to obtain
- Expertise is only available to sellers

- Problem and model assumptions
- Buyer setting low price
- Buyer setting high price
- Optimal expertise
- Summary

Trades occurring

Trades occurring

- Assume a buyer i is only willing to pay $P^* = E\left[V|L\right]$

Trades occurring

- Assume a buyer i is only willing to pay $P^* = E[V|L]$ and has no expertise itself

Trades occurring

- Assume a buyer i is only willing to pay $P^* = E[V|L]$ and has no expertise itself
- A transaction only occurs if the seller j obtains a low signal

Trades occurring

- Assume a buyer i is only willing to pay $P^* = E[V|L]$ and has no expertise itself
- A transaction only occurs if the seller j obtains a low signal
- This happens if the value is high, but the signal is wrong or the value low and the signal correct: $\pi(1-\rho_j)+(1-\pi)\rho_j$

Trades occurring

- Assume a buyer i is only willing to pay $P^* = E[V|L]$ and has no expertise itself
- A transaction only occurs if the seller j obtains a low signal
- This happens if the value is high, but the signal is wrong or the value low and the signal correct: $\pi(1-\rho_j) + (1-\pi)\rho_j$

Buyer profits

Buyer profits

- Trading profits are the value of the security and the trading benefits

Buyer profits

- Trading profits are the value of the security and the trading benefits, less the price paid

Buyer profits

- Trading profits are the value of the security and the trading benefits, less the price paid, if the trade happens

Buyer profits

- Trading profits are the value of the security and the trading benefits, less the price paid, if the trade happens
- $\Pi_B^i = \left(\pi\left(1-\rho_j\right)\left(1-\pi\right)\rho_j\right)\left(E\left[V|L\right]+\Delta V-P^*\right)$

Buyer profits

- Trading profits are the value of the security and the trading benefits, less the price paid, if the trade happens
- $\Pi_B^i = \left(\pi\left(1-\rho_j\right)\left(1-\pi\right)\rho_j\right)\left(E\left[V|L\right]+\Delta V - P^*\right)$
- Value of the security is low as this is the signal of the informed seller

Buyer profits

- Trading profits are the value of the security and the trading benefits, less the price paid, if the trade happens
- $\Pi_B^i = (\pi (1 - \rho_j) (1 - \pi) \rho_j) (E [V|L] + \Delta V - P^*)$
- Value of the security is low as this is the signal of the informed seller, else no trade would happen at this price

Buyer profits

- Trading profits are the value of the security and the trading benefits, less the price paid, if the trade happens
- $\Pi_B^i = \left(\pi \left(1 - \rho_j\right) \left(1 - \pi\right) \rho_j\right) \left(E\left[V|L\right] + \Delta V - P^*\right)$
- Value of the security is low as this is the signal of the informed seller, else no trade would happen at this price

Buyer profits

Buyer profits

- If the buyer is willing to pay $P^{**} = E\left[V|H\right]$, trade will always happen

Buyer profits

- If the buyer is willing to pay $P^{**} = E\left[V|H\right]$, trade will always happen as the value of the seller is never above this amount

Buyer profits

- If the buyer is willing to pay $P^{**} = E\left[V|H\right]$, trade will always happen as the value of the seller is never above this amount
- $P^{**} = Prob\left(V_H|H\right) V_H + \left(1 - Prob\left(V_H|H\right)\right) V_L = \rho_j V_H + \left(1 - \rho_j\right) V_L$

Buyer profits

- If the buyer is willing to pay $P^{**} = E\left[V|H\right]$, trade will always happen as the value of the seller is never above this amount
- $P^{**} = Prob\left(V_H|H\right)V_H + \left(1 - Prob\left(V_H|H\right)\right)V_L = \rho_j V_H + \left(1 - \rho_j\right)V_L$
- Trade does not indicate the value of the security

Buyer profits

- If the buyer is willing to pay $P^{**} = E\left[V|H\right]$, trade will always happen as the value of the seller is never above this amount
- $P^{**} = Prob\left(V_H|H\right)V_H + \left(1 - Prob\left(V_H|H\right)\right)V_L = \rho_j V_H + \left(1 - \rho_j\right)V_L$
- Trade does not indicate the value of the security as it happens regardless of the signal the seller obtains

Buyer profits

- If the buyer is willing to pay $P^{**} = E\left[V|H\right]$, trade will always happen as the value of the seller is never above this amount
- $P^{**} = Prob\left(V_H|H\right)V_H + \left(1 - Prob\left(V_H|H\right)\right)V_L = \rho_j V_H + \left(1 - \rho_j\right)V_L$
- Trade does not indicate the value of the security as it happens regardless of the signal the seller obtains, which is then $E\left[V\right] = \pi V_H + \left(1 - \pi\right)V_L$

Buyer profits

- If the buyer is willing to pay $P^{**} = E\left[V|H\right]$, trade will always happen as the value of the seller is never above this amount
- $P^{**} = Prob\left(V_H|H\right)V_H + \left(1 - Prob\left(V_H|H\right)\right)V_L = \rho_j V_H + \left(1 - \rho_j\right)V_L$
- Trade does not indicate the value of the security as it happens regardless of the signal the seller obtains, which is then $E\left[V\right] = \pi V_H + \left(1 - \pi\right)V_L$
- Trader profits: $\hat{\Pi}_B^i = E\left[V\right] + \Delta V - P^{**} = \Delta V - \left(V_H - V_L\right)e_j$

Buyer profits

- If the buyer is willing to pay $P^{**}=E\left[V|H\right]$, trade will always happen as the value of the seller is never above this amount
- $P^{**}=Prob\left(V_H|H\right)V_H+\left(1-Prob\left(V_H|H\right)\right)V_L=\rho_jV_H+\left(1-\rho_j\right)V_L$
- Trade does not indicate the value of the security as it happens regardless of the signal the seller obtains, which is then $E\left[V\right]=\pi V_H+\left(1-\pi\right)V_L$
- Trader profits: $\hat{\Pi}_B^i=E\left[V\right]+\Delta V-P^{**}=\Delta V-\left(V_H-V_L\right)e_j$

Maximum signal precision

Maximum signal precision

- Buyers offer the high price if $\hat{\Pi}_B^i > \Pi_B^i$

and at some point of information precision, their value is not high enough.

Maximum signal precision

- Buyers offer the high price if $\hat{\Pi}_B^i > \Pi_B^i$
- Signal precision must not be too high: $\rho_j \leq \rho^* = \frac{\pi + (1-\pi)\frac{\Delta V}{V_H - V_L}}{1 + (1-2\pi)\frac{\Delta V}{V_H - V_L}}$

and at some point of information precision, their value is not high enough.

Maximum signal precision

- Buyers offer the high price if $\hat{\Pi}_B^i > \Pi_B^i$
- Signal precision must not be too high: $\rho_j \leq \rho^* = \frac{\pi + (1-\pi)\frac{\Delta V}{V_H - V_L}}{1 + (1-2\pi)\frac{\Delta V}{V_H - V_L}}$
- Low signal precision is required as else adverse selection costs are too high for the buyer to offer the high price

and at some point of information precision, their value is not high enough.

Maximum signal precision

- Buyers offer the high price if $\hat{\Pi}_B^i > \Pi_B^i$
- Signal precision must not be too high: $\rho_j \leq \rho^* = \frac{\pi + (1-\pi)\frac{\Delta V}{V_H - V_L}}{1 + (1-2\pi)\frac{\Delta V}{V_H - V_L}}$
- Low signal precision is required as else adverse selection costs are too high for the buyer to offer the high price

and at some point of information precision, their value is not high enough.

Seller profits

Seller profits

- Total trading benefits of buyers and sellers are $\hat{\Pi}_S^j + \Pi_B^i = \Delta V$

Seller profits

- Total trading benefits of buyers and sellers are $\hat{\Pi}_S^j + \Pi_B^i = \Delta V$
- This implies for seller profits of $\hat{\Pi}_S^j = (V_H - V_L)\, e_j$

Seller profits

- Total trading benefits of buyers and sellers are $\hat{\Pi}_S^j + \Pi_B^i = \Delta V$
- This implies for seller profits of $\hat{\Pi}_S^j = (V_H - V_L)\, e_j$
- Being buyer and seller is equally likely

Seller profits

- Total trading benefits of buyers and sellers are $\hat{\Pi}_S^j + \Pi_B^i = \Delta V$
- This implies for seller profits of $\hat{\Pi}_S^j = (V_H - V_L)\, e_j$
- Being buyer and seller is equally likely
- $\hat{\Pi}^i = \frac{1}{2}\hat{\Pi}_B^i + \frac{1}{2}\hat{\Pi}_S^i - C_i$

Seller profits

- Total trading benefits of buyers and sellers are $\hat{\Pi}_S^j + \Pi_B^i = \Delta V$
- This implies for seller profits of $\hat{\Pi}_S^j = (V_H - V_L)\, e_j$
- Being buyer and seller is equally likely
- $\hat{\Pi}^i = \frac{1}{2}\hat{\Pi}_B^i + \frac{1}{2}\hat{\Pi}_S^i - C_i$
- We take into account the costs of expertise

Seller profits

- Total trading benefits of buyers and sellers are $\hat{\Pi}_S^j + \Pi_B^i = \Delta V$
- This implies for seller profits of $\hat{\Pi}_S^j = (V_H - V_L)\, e_j$
- Being buyer and seller is equally likely
- $\hat{\Pi}^i = \frac{1}{2}\hat{\Pi}_B^i + \frac{1}{2}\hat{\Pi}_S^i - C_i$
- We take into account the costs of expertise

Optimal expertise

Optimal expertise

- First order condition for optima expertise is $\frac{\partial \hat{\Pi}^i}{\partial e_i} = 0$

Optimal expertise

- First order condition for optima expertise is $\frac{\partial \hat{\Pi}^i}{\partial e_i} = 0$
- This gives $\frac{\partial C_i}{\partial e_i} = \frac{1}{2}\left(V_H - V_L\right) > 0$

Optimal expertise

- First order condition for optima expertise is $\frac{\partial \hat{\Pi}^i}{\partial e_i} = 0$
- This gives $\frac{\partial C_i}{\partial e_i} = \frac{1}{2}\left(V_H - V_L\right) > 0$
- Maximum expertise is such that $\rho_j \leq \rho^*$

Optimal expertise

- First order condition for optima expertise is $\frac{\partial \hat{\Pi}^i}{\partial e_i} = 0$
- This gives $\frac{\partial C_i}{\partial e_i} = \frac{1}{2}\left(V_H - V_L\right) > 0$
- Maximum expertise is such that $\rho_j \leq \rho^*$
- If costs are identical, then expertise is identical

Optimal expertise

- First order condition for optima expertise is $\frac{\partial \hat{\Pi}^i}{\partial e_i} = 0$
- This gives $\frac{\partial C_i}{\partial e_i} = \frac{1}{2}\left(V_H - V_L\right) > 0$
- Maximum expertise is such that $\rho_j \leq \rho^*$
- If costs are identical, then expertise is identical, $e_i = e_j$

Optimal expertise

- First order condition for optima expertise is $\frac{\partial \hat{\Pi}^i}{\partial e_i} = 0$
- This gives $\frac{\partial C_i}{\partial e_i} = \frac{1}{2}\left(V_H - V_L\right) > 0$
- Maximum expertise is such that $\rho_j \leq \rho^*$
- If costs are identical, then expertise is identical, $e_i = e_j$
- Trader profits: $\hat{\Pi}^i = \frac{1}{2}\Delta V - C_i$

Optimal expertise

- First order condition for optima expertise is $\frac{\partial \hat{\Pi}^i}{\partial e_i} = 0$
- This gives $\frac{\partial C_i}{\partial e_i} = \frac{1}{2}(V_H - V_L) > 0$
- Maximum expertise is such that $\rho_j \leq \rho^*$
- If costs are identical, then expertise is identical, $e_i = e_j$
- Trader profits: $\hat{\Pi}^i = \frac{1}{2}\Delta V - C_i$

No expertise

No expertise

- If traders have no expertise, $e_i = e_j = 0$ and $C_i = 0$

No expertise

- If traders have no expertise, $e_i = e_j = 0$ and $C_i = 0$
- Then $\hat{\Pi}^i = \frac{1}{2}\Delta V$

No expertise

- If traders have no expertise, $e_i = e_j = 0$ and $C_i = 0$
- Then $\hat{\Pi}^i = \frac{1}{2}\Delta V$
- Not investing into expertise is more profitable

No expertise

- If traders have no expertise, $e_i = e_j = 0$ and $C_i = 0$
- Then $\hat{\Pi}^i = \frac{1}{2}\Delta V$
- Not investing into expertise is more profitable
- If a trader does not invest into expertise, it is profitable for the other trader to do so

No expertise

- If traders have no expertise, $e_i = e_j = 0$ and $C_i = 0$
- Then $\hat{\Pi}^i = \frac{1}{2}\Delta V$
- Not investing into expertise is more profitable
- If a trader does not invest into expertise, it is profitable for the other trader to do so
- This leads to an arms race in the level of expertise

No expertise

- If traders have no expertise, $e_i = e_j = 0$ and $C_i = 0$
- Then $\hat{\Pi}^i = \frac{1}{2}\Delta V$
- Not investing into expertise is more profitable
- If a trader does not invest into expertise, it is profitable for the other trader to do so
- This leads to an arms race in the level of expertise

Over-investment into expertise

Over-investment into expertise

- With trading a (mostly) zero sum game, traders seek to extract profits from other traders

Over-investment into expertise

- With trading a (mostly) zero sum game, traders seek to extract profits from other traders
- To extract more profits, they invest into expertise

Over-investment into expertise

- With trading a (mostly) zero sum game, traders seek to extract profits from other traders
- To extract more profits, they invest into expertise, but as everyone does, no benefits are gained

Over-investment into expertise

- With trading a (mostly) zero sum game, traders seek to extract profits from other traders
- To extract more profits, they invest into expertise, but as everyone does, no benefits are gained
- Investing less into expertise would be preferred by all traders

Over-investment into expertise

- With trading a (mostly) zero sum game, traders seek to extract profits from other traders
- To extract more profits, they invest into expertise, but as everyone does, no benefits are gained
- Investing less into expertise would be preferred by all traders

Individual rationality

Individual rationality

- Traders are over-qualified

Individual rationality

- Traders are over-qualified
- The investment bank directs too much resources towards them

Individual rationality

- Traders are over-qualified
- The investment bank directs too much resources towards them
- This is individually rational

Individual rationality

- Traders are over-qualified
- The investment bank directs too much resources towards them
- This is individually rational, but socially suboptimal

Individual rationality

- Traders are over-qualified
- The investment bank directs too much resources towards them
- This is individually rational, but socially suboptimal

This presentation is based on
Andreas Krause: Theoretical Foundations of Investment Banking, Springer Verlag 2024

Andreas Krause
Department of Economics
University of Bath
Claverton Down
Bath BA2 7AY
United Kingdom

E-mail: mnsak@bath.ac.uk