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The information content of trading volume

Outline

- Information sources
- Fraction of informed traders
- Information precision
- Combined effect
- Summary

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Uncertainties when trading

- Traders face uncertainty about the value of the asset they are trading and the amount of noise trading
- Some investors will have obtained information about the value of the asset
- Informed and uninformed traders often do not know how many investors are informed
- Uninformed investors may also now know how precise the information is

Trading volume as a source of information

- It is common to use the price of an asset as an indication of the information some traders will have received
- Traders have another variable they can observe for free, trading volume
- The importance of trading volume is often neglected, but can provide important insights into the amount of information available in the market

Signal and trading volume

- The further the information that has been received moves the value of the asset from its current price, the larger the opportunities for profits by informed traders

$\Rightarrow$ Traders will trade more to exploit their informational advantage as moving the price towards the new value will only affect their profits minimally

$\Rightarrow$ Trading volume increases the more the value changes

- Given the large amount of trading, prices will also move considerably

$\Rightarrow$ Trading volume does not add much information over observing the price about the signal

Increasing fraction of informed traders

- If only few traders are informed, there will not be much informed trading, but this will increase as more traders are informed

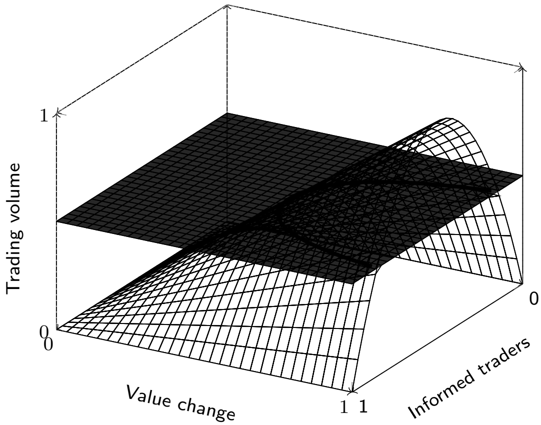
$\Rightarrow$ Trading volume will be increasing in the number of informed traders

- As the number of informed traders increases, they will compete with each other and as not to reveal too much information, reduce their trading

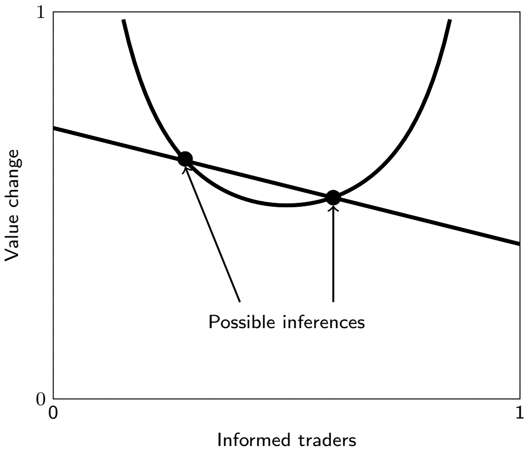
$\Rightarrow$ Trading volume will be decreasing in the number of informed traders

$\Rightarrow$ Trading volume initially increases and then decreases as the number of informed traders increases

Fraction of informed investors and trading volume



Inferring the fraction of informed investors



Combining price and volume information

- A given trading volume can be used to determine the possible fraction of informed traders consistent with the change in the value of the asset
- Using the price, similar inferences can be made
- Combining this information, inferences about the fraction of informed traders can be made
- There might be two possible inferences consistent with the observations
- Often one of these possibilities can be ruled out, such as the majority of traders to be informed

- Information sources
- Fraction of informed traders
- **Information precision**
- Combined effect
- Summary

Increasing precision of information

- If information precision is low, informed traders will only be trading cautiously, there will not be much informed trading, but this will increase as information precision increases

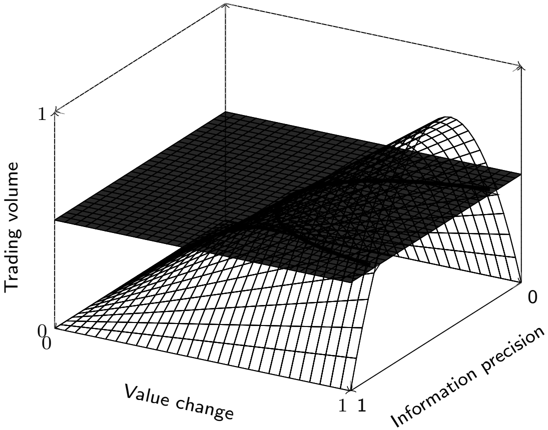
$\Rightarrow$ Trading volume will be increasing in the information precision

- If information is imprecise, informed traders will disagree on the value and will trade with each other, but this reduce as traders agree more and more with information precision increasing

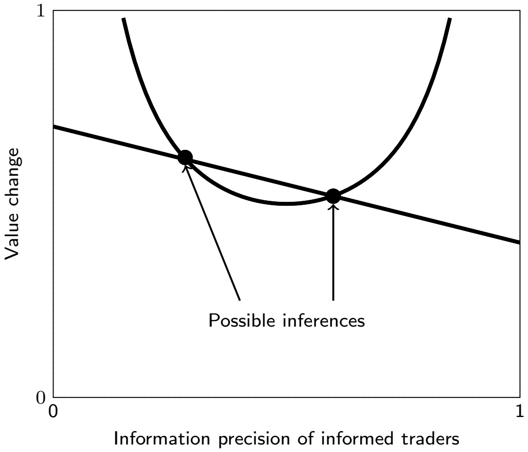
$\Rightarrow$ Trading volume will be decreasing in the information precision

$\Rightarrow$ Trading volume initially increases and then decreases as the information precision increases

Information precision and trading volume



Inferring the information precision of informed traders



Combining price and volume information

- A given trading volume can be used to determine the information precision consistent with the change in the value of the asset
- Using the price, this value change can be inferred
- Combining this information, inferences about the information precision can be made
- There might be two possible inferences consistent with the observations
- Often one of these possibilities can be ruled out, such as information being very precise or very imprecise

Persistence of price changes

- We can interpret the fraction of informed traders and the information precision as the amount of information available in the market
- If trading volume is high, this indicates a large amount of information in the market
- With a large amount of information, any observed price change is likely to be caused by information rather than noise trading

$\Rightarrow$ Price changes accompanied by high trading volume are persistent

- With a small amount of information, any observed price change is likely to be caused by noise trading rather than information

$\Rightarrow$ Price changes accompanied by low trading volume are often reversed

- Information sources
- Fraction of informed traders
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- Combined effect
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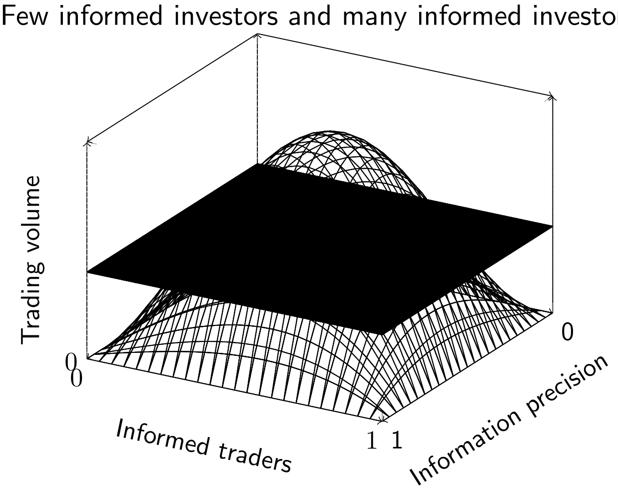
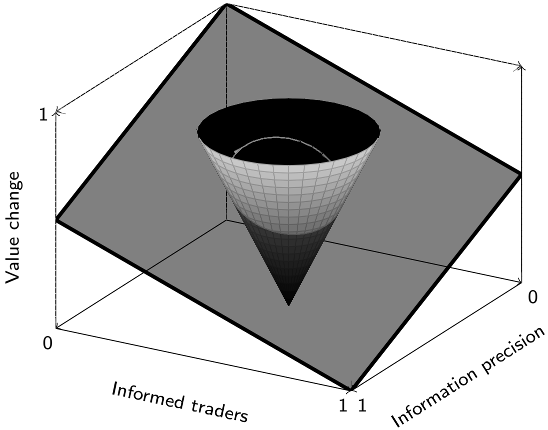
Uncertainty about informed traders and information precision

- So far it was assumed that traders were not aware of either the fraction of informed traders in the market or the precision of information they have
- In a more realistic scenario, neither would be known with certainty
- We can combine both effects on the trading volume and then seek to use the observed trading volume to determine both variables simultaneously

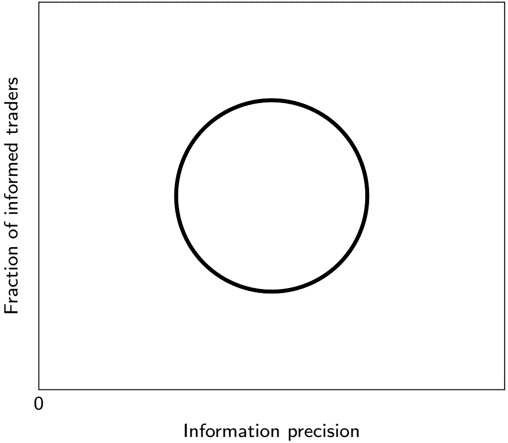
Information precision and number of informed investors



Combining trading volume and price information



Inferring the information precision and number of informed traders



Combinations of information precision and informed traders

- We can not determine a single combination of informed traders and information precision for a given trading volume and price change
- Instead we observe a trade-off between the fraction of informed traders and information precision
- Even if excluding a high fraction of informed traders and very high or low information precision, no single combination can be inferred
- We can determine the amount of information available in the market, but are unable to distinguish its sources: fraction of informed traders or information precision

Uncertainties and observations

- We have four sources of uncertainty: noise trading, value of the asset, fraction of informed traders, and information precision
- We have only two variables that are observed: price and trading volume
- Even with taking expectations about all variables, this only reduces one more uncertainty, leaving three uncertainties for two variables
- If we knew either uncertainty, we had two uncertainties for two variables, which can be solved

Using trading volume to assess market confidence in information

- The price of an asset can be used to assess the contents of information
- The trading volume can be used to assess the confidence of the market in this information
- Price changes accompanied by high trading volume are often seen as driven by information
- Price changes accompanied by low trading volume are often seen as driven by random events

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