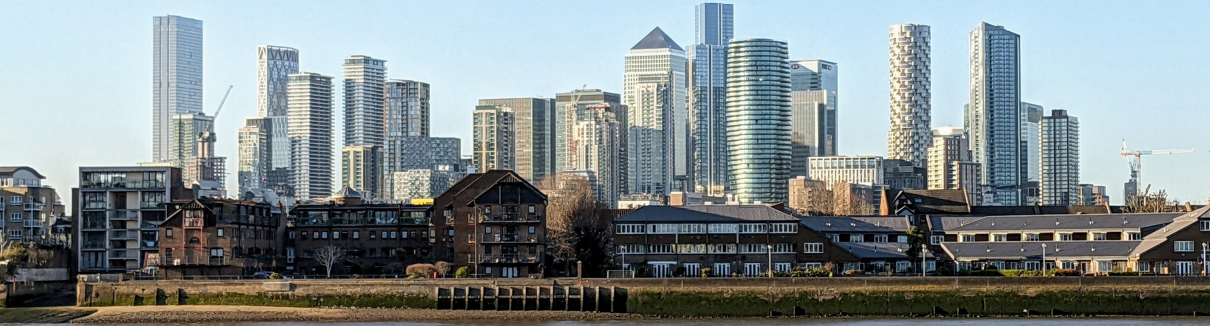
Andreas Krause



Strategic trading

- The key to obtain efficient markets is that at least some investors have access to information and then they use this information to trade, affecting the price of the asset.
- Based on the price that emerges, we can make inferences about the information these investors have.
- We will consider here how informed investors trade and what the implications are for market efficiency, but also liquidity.
- We will also look at trading volume as an additional source of information and will see what it can add.

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Informed trading

- Some traders will acquire information about the value of an asset and seek to exploit their informational advantage
- Through their trading they will reveal some of the information they have obtained
- This information will be included into the price and this process leads to markets becoming efficient
- Prices can reflect information, even if the information itself has never been disclosed
- It is prices that can be used as a proxy for the information itself

Informed trading

→ Trading by informed investors is a key requirement for markets to become efficient and reflecting information available.

- Some traders will acquire information about an asset and thereby gaining an informational advantage over other, uninformed traders.
- They will seek to exploit this informational advantage and they do so by trading with the aim to generate profits. These profits should at least cover the costs of acquiring and processing the information they seek to exploit.

- As they trade on information, we can expect that their decisions to trade will reveal at least some of the information they have obtained. If they buy an asset it suggests the asset has a higher value than the current and if they sell the asset that the value is below the current price.

- The information that can be inferred from their behaviour will be reflected in the price as other traders will gain knowledge and shifting demand and supply, adjusting the equilibrium price.
- We will see that such a process will, over time and through repeated trading by informed traders, lead to markets becoming more and more efficient.

- In the end, the price will reflect the information that informed traders hold.
- This is the case although the information itself has never been disclosed to anyone but the informed traders.

- Prices can be used as a proxy for the information in the sense that the prices reveal the implications of the information for the value of the asset, even though the reason behind this value will never be ascertained.

→ Given the importance of informed investors trading on their information, we will analyse their behaviour in more detail. As assume that informed investors will trade such that they maximise their overall profits, they are said to act strategically and thus this behaviour is often referred to as 'strategic trading'.

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Anonymity of markets

- Informed traders will seek to exploit their informational advantage optimally for as long as they hold this advantage
- Uninformed traders will want to learn this information through observing the trading of informed investors
- Financial markets are mostly anonymous and a trade can be initiated by an informed or an uninformed trader
- We will investigate how the informed trader optimally trades and what implications this has for the market

Anonymity of markets

→ We will now look at the implications of one peculiar property of financial markets, namely that the identity of traders is now known to anyone.

- Informed investors will trade on their information as long as they have an informational advantage over other traders. This could be until all information has been revealed through their trading or the information is otherwise disclosed and becomes public knowledge.
-
  - Uninformed traders, and the wider public, will want to learn the information as then their informational disadvantage is reduced and if they trade, they can reduce their losses.
  - The only source of information is observing the trading of informed investors as they will not reveal their information as that would eliminate their informational advantage.
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  - A property of most financial markets, and all formal exchanges, is that the identity of the trader is not known. It is know known whether a trader will want to buy or sell an asset, how much they want to buy or sell, and at what price. It will not be known whether the trader is informed or uninformed or what their motivation for trading is.
  - Therefore a trade submitted to the market can be that of an informed trader, but it could laos be that of an uninformed trader. If it was an informed trader submitting an order, there would be information contained in the order, while the order of an uninformed trader would not contain any information. However, in markets these two traders cannot be distinguished.
-
  - In such a setting we will look at how the informed trader decides to trade and how much he seeks to buy or sell.
  - This trading demand by informed traders is only used to then evaluate the implications it has for the market quality overall, most prominently its market efficiency and liquidity.

→ Later we will also look at what information can be extracted from the total amount of trading that occurs, the trading volume.

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Informed traders optimising their demand

- Informed investors will have time to exploit their informational advantage until the information they hold become common knowledge
- Facing only uninformed traders with random demands, they will seek to submit buy or sell orders that are maximizing their total profits
- Their behaviour has implications for market efficiency and the general quality of markets, in particular its liquidity
- We will explore how market efficiency and liquidity evolves over time

Informed traders optimising their demand

→ We will first look at who informed traders determine their trades optimally and then what the implications are for the market.

- We assume that having obtained information, informed traders than have a finite time until the information becomes public knowledge and any advantage they might have had is eliminated.
- We assume for simplicity that informed traders are only facing so called noise traders, which trade randomly and do not maximize any objective function. During the time period until the information is revealed, informed traders seek to maximize the profits they can make.
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  - We will investigate not so much the demand of informed traders itself, but will look at how their behaviour affects market efficiency primarily,
  - But we will also look at other qualities of the market,
  - most prominently liquidity. The reason for looking at liquidity is that market efficiency is not directly measurable, while liquidity can at least be determined approximately. Therefore, we can make inferences from observing market liquidity and from there make inferences about market efficiency.
- We not only look at these properties at one point in time, but pay particular attention to the evolution of efficiency and liquidity over time, that is from the moment information is received until it is publicly disclosed.

→ We will now look at a basic model that allows us to analyse these market properties.

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Trading with informed investors
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→ The model used here, Kyle (1985), is one of the key models in the literature on financial markets and forms the basis for much of the analysis of financial markets and how trading affects market outcomes.

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Market efficiency is not instant

- Markets become informationally efficient only over time, and the more widespread information is held and the more often it can be used, the sooner the market becomes efficient
- The liquidity of a market similarly increases over time as the asymmetric information reduces and markets become more efficient

? Markets are constantly moving and do not seem to converge to a price reflecting the information; is this a sign of markets being inefficient?

! Firstly, markets will move due to noise traders submitting their orders, price trends need to be assessed stripping out their impact; second, new information arrives continuously and changes the fundamental value, causing the prices trying to catch up permanently

Market efficiency is not instant

→ We can now summarize the key results of this model.

- We have seen that markets are not becoming efficient instantly, but slowly move towards efficiency over time as trading continues.
  - If information is held by more traders or traders can trade more often or for longer using their information before it is publicly revealed, then markets will become more efficient sooner.
- Similarly, the liquidity of the market increases over time.
  - This is because as the market becomes more efficient and asymmetric information reduces, making price movements in reaction to trading less pronounced over time.
- [?] We see that markets are always volatile, prices are increasing and decreasing all the time, and seem to never come to rest. Our model implied that prices should slowly converge to the the value of the asset, can we therefore conclude that financial markets are very inefficient?
- [!] Our analysis, through taking expectations, eliminated the random demand of noise traders, so prices would never fully converge, but even in this model would fluctuate randomly; admittedly not as much as they do in real market. However, more importantly, we do not have a single piece of information that becomes available which is then traded upon; in reality information arrives all the time, even before previous information has been disclosed. It is therefore that prices are trying to move towards the value of the asset and are constantly pulled in one direction and then into another direction.

→ While the model was highly stylised, we could nevertheless gain some insights into the behaviour of markets and how to interpret their movements.

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Trading volume as a source of information

- Many market participants are usually not aware whether additional information exists, how widely it is known, and how precise it is
- These unknown factors make it difficult to use the price as a source of information
- An additional source of information is available, trading volume
- We will show how trading volume can be used to assess the degree of asymmetric information and improve the knowledge about information

Trading volume as a source of information

→ All the focus is in prices as a source of information about the value of assets; the reason is that prices are easily available at no or low costs. However, information on trading volume is available similarly and receives much less attention. We will here look at the information that can be obtained from observing trading volume.

- The previous model assumed that all market participants know that information is available in the market in the first place,
  - but then they were also assumed to know how many traders know this information,
  - and even how precise the information is (in the previous model information was assumed to be perfect).
- In reality neither of these aspects are known, although often the existence of some information can be inferred easily. However, all these factors will have an impact on how the price changes over time, making it difficult to assess the information itself as there are many other factors involved.
- We suggest here to use an additional source of information, namely trading volume. The idea is that having more information should allow us to make more precise inferences about the information informed investors have and thus the value of the asset.
- We will show that trading volume can give us an insight into the degree of asymmetric information that uninformed investors are exposed to. This will allow us to provide a more precise analysis of market events.

→ We will rely on an intuitive understanding of the consequences of the behaviour of informed traders on trading volume, although these intuitions are based on more formal models.

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The information content of trading volume
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→ We will now look at how trading volume relates to the change in the value of the asset, the number of traders that have received this information and how precise this information is.

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Informational asymmetry and trading volume

- Trading volume allows to assess the amount of information that is available in a market
- If price movements are accompanied by high trading volume, this suggests that the information is either widespread or precise

? Rumours circulate about a company receiving a bid to be taken over soon; if there is no increase in trading volume, can this rumour be dismissed?

! The low trading volume is a sign that the information is either vague or few people hold this information, but it can nevertheless be true.

Informational asymmetry and trading volume

→ We can now summarize the key results we have obtained.

- We have seen that using trading volume, we can obtain knowledge about how much information is available in the market, thus the extent of asymmetric information, and observing the price gives us the 'size' of the information, thus how much the value changes.
- We have argued that larger price movements that are accompanied by a high trading volume are most likely driven by information and therefore more reliable than similar price movements that are happening with low trading volume.
- [?] Assume you hear about rumours about a company, but see no increase in the trading volume, Is it therefore that the rumour you have heard is false as it seems not to be based on information?
- [!] Low trading volume implies that any information is either very imprecise or very few traders hold this information. Hence you might be one of the 'lucky' traders to have this information. It is also the case that imprecise information can be correct at times. The statement on trading volume and the persistence of price movement is only true on average, individual cases might be very different.

→ We have seen that trading volume can provide us with additional information if we do not know the quality of information in the market. However, observing trading volume alone, in addition to the price, might not allow us to distinguish between all types of other unknown variables.

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Summary of key results

- Prices can be used to assess the contents of information traders hold and markets become efficient over time
- Trading volume can be used to assess the degree of asymmetric information and high trading volume should decline over time as the markets become more efficient
- Combining price movements with information on trading volume gives us a more accurate assessment of information that may be hold by some traders

Summary of key results

→ We can now summarize the key results about strategic trading.

- Prices reflect the content of information, although not the information itself.
- Markets reflect this information not instantly, but it is due to informed traders exploiting their informational advantage optimally that markets become efficient only over time.

- While price reflect the contents of information, trading volume can be used to determine how much asymmetric information there is in the market.
- As more and more information is included into the price, trading volume should change and initially high trading volume should reduce, while in situations where adverse selection (asymmetric information) was particularly high, its reduction over time should increase trading volume.

- If we observe price movements in markets together with the trading volume, allows us to asses the quality of information that informed traders have obtained.

→ We thus see that by only observing prices and trading volume, we can explain market movements, even though we do not have access to the actual information on which such movement is based.

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