MARKET MANIPULATION ON THE OSLO STOCK EXCHANGE



Abstract

This term paper investigates the effects of Bergen-based investor Atle Sandvik Pedersen's extensive self-trading in the REC Silicon ASA stock, which resulted in him receiving a NOK 5 million infringement fee for market manipulation. The paper analyses how Pedersen was able to engineer artificial price movements in the REC Silicon ASA stock, inflate the overall trading volume with a substantial amount through trades between himself and his company, and how he contributed to increased volatility in the stock during the period from March 1, 2021, to December 1, 2022. Furthermore, the paper discusses the aftermath of the case, and the consequences this had for the market of REC's stock and the company itself up to the present (October 31, 2023). As part of the term paper, the authors have interviewed "Johannes", a Norwegian day trader who makes a living trading on the Oslo Stock Exchange, including REC Silicon.

Group 8

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Abbreviations

B.O.D.	Beginning of day
E.O.D.	End of day
MAR	Market Abuse Regulation (EU Directive)
NHH	Norwegian School of Economics
OBX	Index of the 25 most liquid stocks on OSL
OSEBX	Oslo Stock Exchange index
OSL	Oslo Stock Exchange
RECSI	REC Silicon ASA stock
TFSAN	The Financial Supervisory Authority of Norway
WACKER	Wacker Chemie AG stock

1 Introduction

On March 29, 2023, news broke in several Norwegian media outlets that The Financial Supervisory Authority of Norway (TFSAN) had issued an infringement fee of NOK 5 million to Bergen-based investor Atle Sandvik Pedersen for market manipulation on the Oslo Stock Exchange. In a letter (The Financial Supervisory Authority of Norway, 2023) dated March 20, 2023, TFSAN states that during the period from March 1, 2021, to December 1, 2022, Pedersen performed a total of 5,667 trades between himself and his company Dichesbuen AS. The self-trading was performed in six different stocks on the Oslo Stock Exchange, dominated by 4,550 trades in the REC Silicon ASA stock for a total trade amount of NOK 5.17 billion.

While TFSAN's investigation has not proven that Pedersen has profited from these trades, it is stated in the letter that the trades *"do not change the actual ownership of the stocks, and constitute a large share of the daily trading volume for the stocks in question"* and that the self-traded volume on the days in question is *"apt to give a misleading signal regarding supply, demand and price for the stocks in question"* (The Financial Supervisory Authority of Norway, 2023) [p. 12].

2 Research Question

Cases involving market manipulation are not common on the Oslo Stock Exchange or in Norwegian markets in general. The Pedersen-case can therefore provide a rare opportunity to study the effects market manipulation has in a real-world market. The purpose of this term paper is therefore to investigate and attempt to answer this overarching research question:

"How has Atle Sandvik Pedersen's extensive self-trading affected prices, volatility and trading volume of the REC Silicon ASA stock?"

While Pedersen has performed self-trades in six different stocks, this term paper will focus specifically on Pedersen's trading activity in the REC Silicon ASA stock, as this is where he

has performed the vast majority of the self-trades. The term paper will cover the period from March 1, 2021, to October 31, 2023, which includes the period covered by TFSAN's investigation (March 1, 2021, to December 1, 2022) as well as the months following the infringement fee as a reference period.

3 Background

3.1 Atle Sandvik Pedersen and Dichesbuen AS

Atle Sandvik Pedersen is an experienced stock trader and investor in Norway. During the last decade, he has been mentioned on several occasions in some of the biggest Norwegian financial newspapers, as well as trading forums, regarding his stock positions and trades (Risbakken, 2022). He has also been one of the highest earners in his home city Bergen, according to yearly Norwegian tax reports (Olsvoll, 2011). This has made him known both inside and outside of the financial industry.

Pedersen has for the last twenty-five years earned his money privately trading stocks, focusing on Norwegian-based companies traded on the Oslo Stock Exchange (Risbakken, 2022). He founded his own investment company, Dichesbuen AS, in 2014, and has since traded stocks using the company's capital (Proff.no, 2023). He holds 99.5% ownership of the company, with the remaining 0.5% belonging to his children, and has power of attorney over the company's trading. This has however not stopped him from trading as a private investor using his private money. During the last three years, Pedersen has executed thousands of transactions in different Norwegian stocks, sometimes on behalf of Dichesbuen (Tekinvestor.no, 2023) and other times with his private account (Tekinvestor.no, 2023). In many of these cases, he has traded the same stock during the same day, using both his private capital and the assets in Dichesbuen.

3.2 REC Silicon ASA

REC Silicon ASA is a Norwegian company listed on the Oslo Stock Exchange. The company manufactures silane gas and polysilicon, which are key materials in the electronic and solar industries, most notably regarding the production of solar panels and semiconductors. Despite having its headquarters located in Lysaker, Norway, REC Silicon has two manufacturing facilities in the United States, one in Moses Lake, Washington and the other in Butte, Montana. Combined, these facilities can produce more than 20,000 tons of polysilicon yearly (REC Silicon, 2023). This makes it one of the industry-leading companies with regards to production capacity outside of China (PVTime, 2023).

During the last years, there has been an increased demand for semiconductors and components used in renewable energy industries, and the demand is predicted to continue increasing this decade (Burkacky, Dragon, & Lehman, 2022). This has made RECSI an interesting stock among investors, due to the company's potential future revenue growth. As of October 2023, REC Silicon is, however, yet to break even (Simply Wall St. , 2023). This makes its stock price speculative, as its future cash flows are hard to predict and are highly uncertain. Both the solar and semiconductor markets are unpredictable as supply and demand are highly dependent on global trade (Thompson, 2023) and national environmental regulations and policies (Solar Energy Technologies Office, 2023). The uncertainty regarding REC Silicon's future, and its volatile nature, has attracted a lot of Norwegian amateur investors. Despite its market cap

ranging from NOK 5-10 billion the past few years, which is relatively small, it is the fourth most frequently owned stock by men on Nordnet, beaten only by companies such as Tesla, Equinor and Aker BP (Settem, 2023). Figure 1 shows the daily closing price of RECSI. The graph shows significant price movements, providing traders with opportunities for both profits and losses.

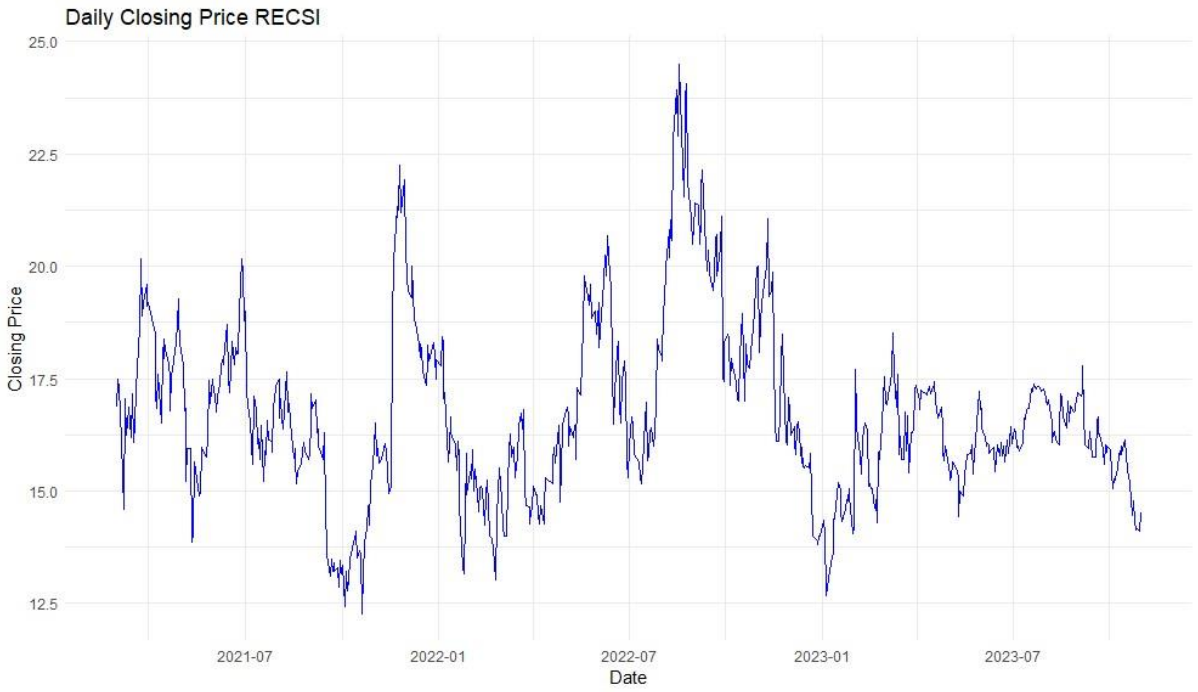


Figure 1 – Daily closing price in RECSI from March 2021 to October 2023. Data source: (Yahoo! Finance, 2023).

3.3 Transaction Cost and an Important Assumption

Transaction costs, or brokerage, is as the name suggests a fee related to trading securities. The fee is usually a few basis points of the total trade amount and is paid to the market operator, such as a broker, providing the trading platform and service. While not specifically important to the term paper's analysis, it is important to note that self-trading to such an extent would incur substantial transaction costs. We do, however, know that the brokers in question offer a fixed price agreement, and it is reasonable to expect that Pedersen has such an agreement.

3.4 March 1, 2021 – an Important Date

A brief overview of the Pedersen case was given in the introduction to provide some context for the term paper's research question. The case is, however, quite complex, and to answer the research question it is necessary to understand the case's nature and the core mechanics of Pedersen's self-trading.

March 1, 2021, marks the beginning of the period TFSAN has investigated for the Pedersen case. Interestingly though, this specific date coincides with the day the EU's Market Abuse Regulation (MAR) was absorbed into Norwegian legislation. This is important because the implementation of MAR led to several subtle regulatory changes (The Financial Supervisory Authority of Norway, 2022), two of which are significant to the Pedersen case.

> (1) The reporting obligation for market operators was expanded from only covering suspicious transactions to also include suspicious order placements, cancellations, and

changes. In addition, the reporting process was standardized through the "Suspicious Transactions and Orders Reports" (STORs).
(2) TFSAN was given authority to impose infringement fees for several types of infringements of MAR, including market manipulation, illegal dissemination of insider information and the obligation to keep insider lists.

In Norway, it is possible to request access to public documents through a search service called *einnsyn.no*, and here one can find a list of all the documents pertained to the Pedersen case. The authors of this term paper have requested access to several of these documents, but the requests were rejected due to the documents being protected by privacy law. However, the title of each document is available, and the well-trained eye may notice that the first document in the case was an incoming document to TFSAN titled "Suspicion of market manipulation" (eInnsyn, 2023). This document is the starting point of the case, and while it is impossible to confirm this without access to the document, it is reasonable to suspect that it is a direct result of the new reporting requirements from MAR.

The second regulatory change is important for the outcome of the case, as it gave TFSAN the required authority to impose an infringement fee without having to go through the Norwegian Judicial System. Note that the period investigated for the case does not include any trades performed before the introduction of the MAR. According to the letter, TFSAN did however warn Pedersen as early as September 2019 that similar self-trading, then in the Funcom NV stock, could be in breach of regulations (The Financial Supervisory Authority of Norway, 2023).

3.5 Excessive Self-Trading (Wash Trading)

The core of the case is that Pedersen has performed extensive self-trading. From March 1, 2021 to December 1, 2022, TFSAN have found 5,667 trades, 4,550 of these in RECSI, where Pedersen is on one side of the transaction, and his company Dichesbuen AS, where Pedersen holds trading power of attorney, is on the other. The total turnover of these trades is NOK 5.17 billion, 4.65 billion of which is in RECSI. The trades are spread across 116 trading days, and on each day Pedersen's self-trading has accounted for at least 10% of the daily trading volume. On July 5, 2022, Pedersen's volume accounted for more than 35% of the daily volume (The Financial Supervisory Authority of Norway, 2023).

Share of daily turnover in RECSI	Number of days within interval
10% - 14.99%	37
15% - 19.99%	40
20% - 24.99%	31
25% - 29.99%	7
30% - 34.99%	0
35% - 39.99%	1
Total days	116

Table 1 - Distribution of days Pedersen's self-trades account for 10 to 40 percent of daily turnover in RECSI, shown in intervals of 5%. Source: (The Financial Supervisory Authority of Norway, 2023)

An important aspect of these trades is that the stocks never actually change ownership, as Pedersen's real portfolio is the sum of his personal and his company's portfolios. However,

there is no way for the other players in the market to know who is on the sell-and-buy side of these transactions.

As a result, the transactions give false indications of buy or sell pressure, and any trades performed by the other players because of these indications will be, at least partially, based on false pretences. Pedersen, the person behind the trades, is the only player in the market who knows these signals are false and could potentially take advantage of this information to make a profit. This kind of self-trading is therefore considered a form of market manipulation called *wash trading*.

3.6 Aggravating Circumstances and False Claims

TFSAN considers the large scope of Pedersen's wash trading as an aggravating circumstance. As a professional trader and investor with years of experience, Pedersen should, according to TFSAN, have understood that his trading behaviour was against regulation and could at best have been grossly negligent. The fact that TFSAN warned him on two separate occasions in September 2019 and August 2022 that his behaviour could be in breach of regulation supports this claim.

According to TFSAN's letter, Pedersen defends his behaviour claiming the trades were performed by algorithms, and that he believed that it was the algorithm, and not him, who was responsible for finding buyers or sellers for the trades. Furthermore, he claims that as much as 90% of his trades were performed in the Dark Pool market. However, TFSAN states that all the trades included in the case are in fact performed on the Oslo Stock Exchange and that the Transaction Reporting System (TRS) reports show that none of the trades are performed using algorithms, as the fields for "executing algorithm" is empty. All the trades are therefore personally executed by Pedersen.

3.7 Interview with "Johannes", a Day Trader in RECSI

In relation to the term paper, we have performed an interview with a day trader who makes a living trading on the Oslo Stock Exchange. As he would like to remain anonymous, we have given him the name *"Johannes"*. Johannes has been closely following the REC Silicon stock since the beginning of 2020 and has since the end of 2020 been trading in the stock daily. Through the interview, Johannes gave a lot of interesting insight into the dynamics of the REC Silicon stock. The entirety of the interview can be found in the appendix, while quotes from Johannes are used throughout the term paper where applicable.

4 Investigating the Effect of Pedersen's Trades on Price

4.1 Trade Data Availability and an Important Assumption

As our requests for access to the documents pertaining to the case were rejected by TFSAN due to privacy laws, there is no way of obtaining a full list of Pedersen's orders and trades. TFSAN's letter does however contain a table showing the ten largest wash trades performed by Pedersen in RECSI. Although ten trades are a small sample size for the 4,550 trades Pedersen performed in RECSI, they are the only trades available, and for the sake of the analysis, it is necessary to continue under the assumption that the price effect of these trades is representative for the effect of all 4,550 trades. We admit that the results we find from studying

these ten trades are not necessarily sufficient for inference of the general wash trade effects, but we can justify this assumption as it is natural to believe that the largest trades have the largest and clearest impact on the market. However, it is not clear whether all the trades are of equal significance.

Date	Time	Price (NOK)	Volume	Trade amount (NOK)
10.01.2022	11:20:10	17.28	2,014,742	34,814,742
23.03.2022	15:17:19	17.18	1,973,278	33,900,916
05.01.2022	14:55:33	18.69	1,620,200	30,281,538
25.05.2022	13:18:52	19.50	1,520,000	29,640,000
20.01.2022	13:20:26	16.48	1,470,333	24,231,088
05.07.2022	9:13:16	16.73	1,428,000	23,890,440
13.10.2021	12:19:13	14.40	1,404,297	20,221,877
24.11.2022	15:46:26	18.52	1,350,750	25,015,890
11.11.2021	11:51:05	16.18	1,340,179	21,684,096
13.05.2022	11:24:47	16.60	1,284,357	21,320,326

Table 2 - Pedersen's ten largest wash trades. Source: (The Financial Supervisory Authority of Norway, 2023)

4.2 Why Wash Trade?

To understand what Pedersen may have wished to achieve with his trading behaviour, it is important to understand the financial theory behind wash trading. According to Investopedia, *"Wash trading is a process whereby a trader buys and sells a security for the express purpose of feeding misleading information to the market"* (Chen, Wash Trading: What it is and how it works, with examples, 2022). By trading stocks with himself or an accomplice, the wash trader gives the market a false indication of buy or sell pressure and a movement in price. The wash trader hopes that other players will interpret this indication as if there is someone in the market who knows something and is willing to quickly liquidate or take a position before the market has time to react. As the other traders cannot know that this indication is false, they may decide that they too should liquidate or take a position. Such actions will amplify the initial indication of buy or sell pressure and thereby further drive the price in the direction the wash trader made his initial price movement. Furthermore, a downward price movement may also trigger stop-loss orders in the market, increasing the price movement even more. This way, the wash trader manages to manufacture a price change in the market. An upward movement can provide the wash trader with a higher sell price, or he may take a short position expecting the price to return to its former level. A downward movement may on the other hand provide the wash trader with a lower entry price. This is supported by Kong and Wang who found that *"(1) order-based manipulation affects market liquidity and trading behaviour, (2) the manipulator pretends to be informed or expects to be seen as informed by choosing a "right" time to implement the manipulation, and (3) the manipulation rapidly changes investor reaction to the market order/depth imbalance in the short run, and the effect gradually drops during the postmanipulation period*" (Kong & Wang, 2014).

4.3 Price Effect of Pedersen's Ten Largest Trades

To investigate the price effect of Pedersen's ten largest trades, we have gathered minute-by-minute data of RECSI using the Bloomberg Terminal available at the NHH library computers. *Figure 2* shows the minute-by-minute closing price and trading volume for RECSI on January 10, 2022. At 11:20:10, a trade is performed between Pedersen and Dichesbuen for a total of

2,014,742 stocks, 97.49% of the traded volume between 11:20 and 11:21. As indicated by the red colour of the volume bar, the trade drives the price down, as the open price at 11:20 is NOK 17.28 and the closing price at 11:21 is NOK 17.11. To the market, the size and direction of price movement indicate two things: (1) high volume constitutes this is a large player, and (2) this player potentially knows something they do not, driving price down.



Figure 2 - RECSI minute-by-minute price and trade volume on January 10, 2022. At 11:20:10, north of 2 million stocks are traded between Pedersen and Dichesbuen AS. The red colour of the volume indicates the price is driven down. In less than 12 minutes, the price falls by NOK 0.34 (2.0%).

The market reaction after Pedersen's trade is that prices continue to fall. In the short term, the price hits a low of NOK 16.94 between 11:31 and 11:32. For the rest of the day, the price has a negative trend, but it must be mentioned that some of this could be explained by other trades in the market, such as the 1,069,842 stocks traded between 13:17 and 13:18. At the end of the day, the price is NOK 15.78 at 16:20, falling to NOK 15.64 after the closing auction.

Figure 3 shows RECSI's minute-by-minute price and trading volume on January 5, 2022, and illustrates much of the same effect. At 14:55:33, a trade of 1,620,200 stocks is executed between Pedersen and Dichesbuen. Again, the trading volume is substantially larger than what has been seen throughout the day, and following the trade the prices fall significantly. At 14:55, the price is NOK 18.67, but by 15:09 the price has fallen to NOK 18.26. After the initial reaction, the price somewhat stabilizes, before increasing slightly towards E.O.D.

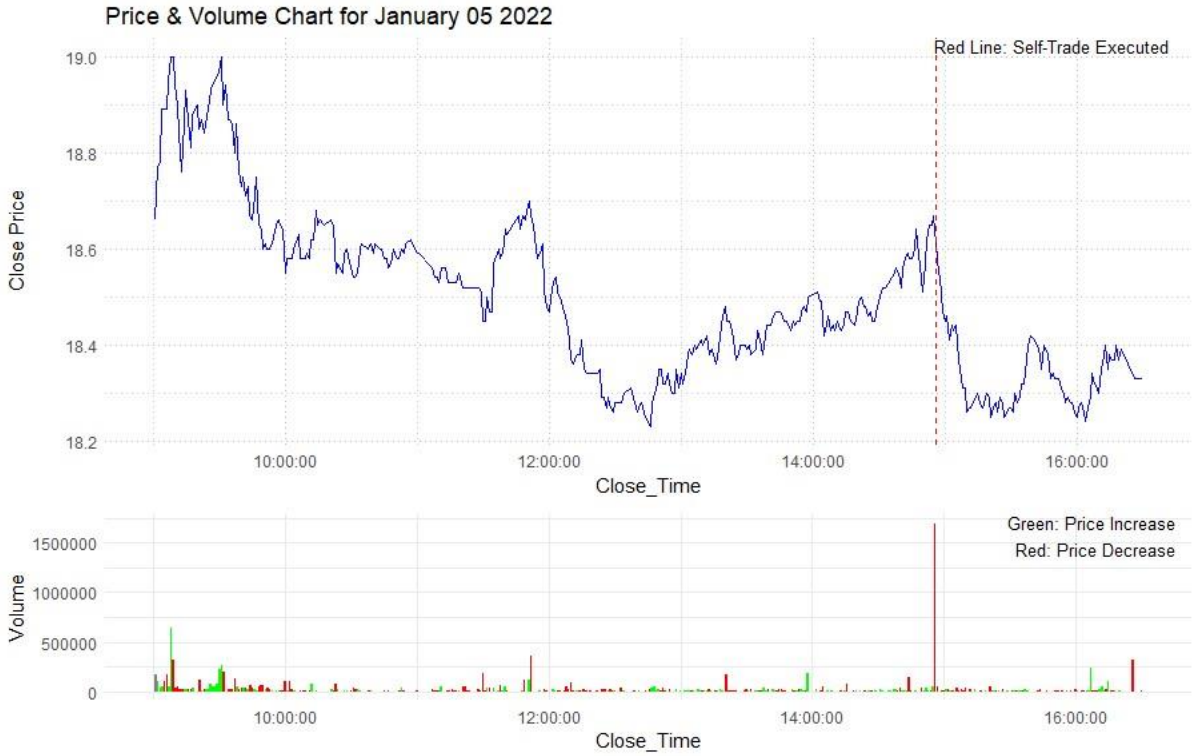


Figure 3 - RECSI minute-by-minute price and trade volume on January 5, 2022. Following the trade at 14:55:33, the price fell by NOK 0.41 (2.2%) in less than 15 minutes.

On other days, the effect is not as clear. *Figure 4* shows the price and trade volume on May 13, 2022. Throughout the day, the price experiences an upward trend. At 11:24:47, a trade of 1,284,357 stocks at NOK 16.60 happens between Pedersen and Dichesbuen, this time pushing the price upwards from NOK 16.55 at 11:24 to NOK 16.65 at 11:25. Directly following the trade, the prices fall slightly before continuing the upward trend. According to the theory on wash trades, the goal for this trade should be that the initial upward price movement should result in a further upward movement. The price continues to increase throughout the day, which is in line with the daily trend. Although the result is an upward movement in price, it is not clear that the movement is the direct result of Pedersen's trade. Note there are several other trades of large volume, most of these pushing the price upwards as the green colour indicates the price increased during the minute the trade was performed.

Figures for the remaining seven trades and their impact on the daily price (including the three abovementioned trades) may be found in the Appendix. The results from analysing these trades are summarized in *Table 3*.



Figure 4 - RECSI minute-by-minute close price and trade volume on May 13, 2022.

Trade #	Date	Direction of initial price movement	Desired effect achieved	Comment
1	10.01.2022	Down	Yes	Clear downward movement short term after trade. Price continues falling throughout the day.
2	23.03.2022	Up	No	Price is on a downward trend through the day. Trade pushing price up performed on a short upward movement, but price immediately moves downward after trade.
3	05.01.2022	Down	Yes	Clear downward movement after trade.
4	25.05.2022	Down	Yes	Clear downward movement after trade.
5	20.01.2022	Down	Yes	Clear downward movement after trade.
6	05.07.2022	Down	Yes, but not as clear	Downward movement after trade, but not as clear as prices are very volatile moving up and down frequently.
7	13.10.2021	Down	Yes	Clear downward movement after trade.
8	24.11.2022	Down	Yes, but short duration	Clear downward movement short term after trade, before price starts to increase.
9	11.11.2021	Down	Yes	Clear downward movement after trade.
10	13.05.2022	Up	Unclear	Price is on an upward trend through the day. Unclear if this trade had desired effect. Short term, price moves downward (against initial movement) before continuing up.

Table 3 - Overview of price impact from the ten largest trades between Pedersen and Dichesbuen.

While the results cannot be described as conclusive evidence due to the small sample size, we note that for 80% of the trades, the market reaction to Pedersen's trades is to continue the price movement in the same direction, at least in the short term. Of the ten trades, eight initially move the price down and two initially move the price up. While it is tempting to state that driving the price down has a 100% success rate, and driving the price up has a 0% success rate, eight and two trades respectively is hardly enough data to support this claim.

The results do however indicate that for the majority of the trades, prices continue to move in the direction of the initial movement created by Pedersen's trades. This indication is supported by financial theory on wash trades, as the results show exactly what one would expect from a

theoretical perspective. Furthermore, when presented with the ten price charts of RECSI, our interview object Johannes was very clear that the pattern seen on January 5, 2022, is very typical for RECSI.

"January 5, especially, with a sudden spike in volume followed by a steep change in price, is typical. If you had shown me this graph, without any numbers, and asked me which stock this is on the Oslo Stock Exchange, I would have answered REC Silicon. This pattern is, to my knowledge, unique for RECSI and I have seen this pattern on many occasions." – Johannes.

Such a strong statement from a person following the REC Silicon stock daily further supports the assumption that the ten largest trades, especially the ones where we see a clear effect, are representative for most of the trades between Pedersen and Dichesbuen. Combined with financial theory, we can therefore with some degree of confidence claim that Pedersen has been able to engineer artificial price movements in the market by trading with himself.

5 Investigating the Effects of Pedersen's Trades on Volatility

In his book Trading & Exchanges, Larry Harris describes volatility as *"the tendency for prices to change unexpectedly"* (Harris, 2003). In other words, volatility is a metric that describes how much, how fast, and how often the price of a security changes over time. High volatility means more unstable prices and indicates a higher level of risk (and potential reward) associated with trading in the security. On the other hand, low volatility means a more stable price with less associated risk. Understanding volatility is necessary to operate successfully in financial markets, as the metric is an important factor for decision-making.

One aspect that often explains why a company or a stock has a relatively high volatility may be that there is large uncertainty regarding the intrinsic value of the company. For RECSI, this happens to be the case. With uncertainty regarding the re-opening of their factory in Moses Lake, Washington, different players in the market have probably had different conceptions of the likelihood of this becoming reality. This has historically made the stock price sensitive to news that may change the future aspirations of the company. Another factor that may contribute to different conceptions is the prices of polysilicon as these, like oil prices, may fluctuate over time.

5.1 Impact of Wash Trading on Volatility

A direct consequence of trading with oneself above or below the current market price is that the price changes. Therefore, by definition, this trading behaviour creates volatility. This is further supported by the analysis of price impact in the previous section, and is in line with Aggarwal and Wu who state *"Manipulation is associated with greater stock volatility, great liquidity, and high returns during the manipulation period"* (Aggarwal & Wu, 2006). It is therefore reasonable to expect that the volatility of RECSI should fall when Pedersen stopped wash trading. *Figure 5* shows the rolling 30-day historical volatility of RECSI. We can see a significant decrease in RECSI's volatility starting around the end of March 2023.

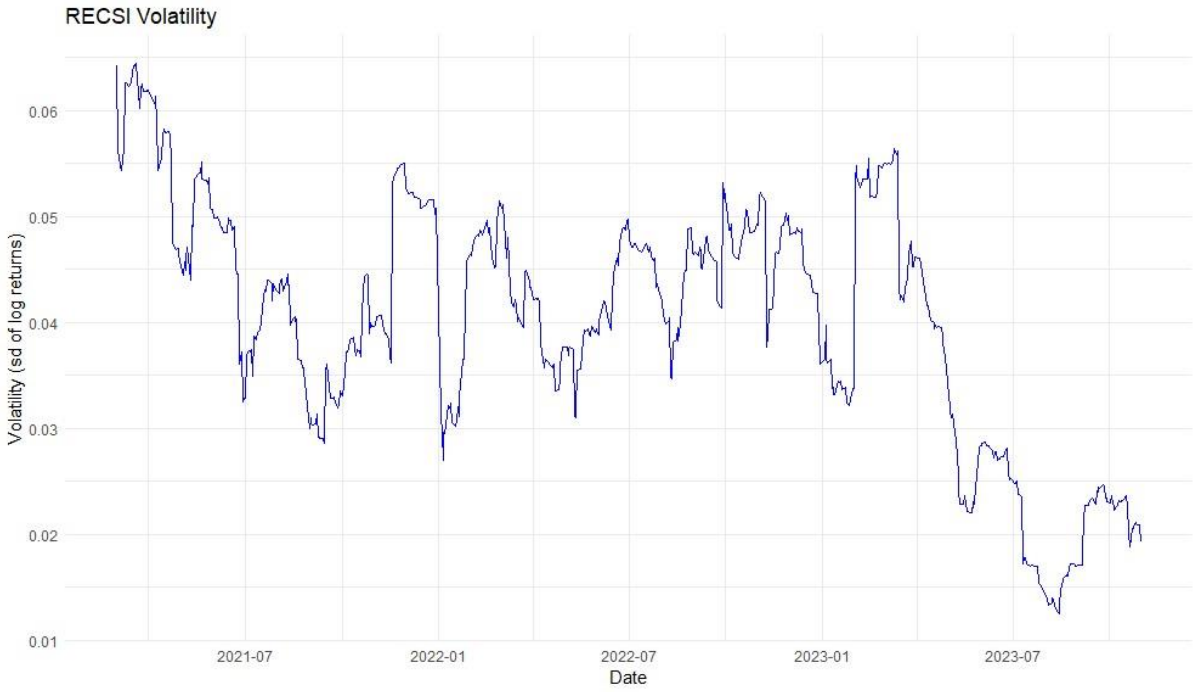


Figure 5 - RECSI rolling 30-day historical price volatility measured in standard deviation of log returns from 01.03.2021 to 31.10.2023. Data source: (Yahoo! Finance, 2023)

The infringement fee was imposed on March 20, 2023. As part of the fee, TFSAN also states in their letter that they demand an immediate stop to this kind of trading behaviour, under threat of further sanctions if this demand is not met. As there have been no further sanctions, we know there have been no further wash trades after this date. The drop in volatility coincides with this date and gives a strong indication that Pedersen's wash trading contributed quite significantly to the volatility of RECSI and that the end to his trading behaviour has resulted in a decrease in volatility.

On the other hand, while there is a clear indication of correlation, this is not conclusive evidence, as many other factors could also help explain this negative trend. To answer this, it is necessary to investigate whether there was a similar pattern in the Norwegian stock market, or the polysilicon industry itself during the period that could explain this negative trend.

5.2 External Factors

To investigate trends in the Norwegian stock market, it is natural to compare RECSI to the Oslo Stock Exchange Benchmark Index (OSEBX). This is an index containing around 60 of the largest companies listed on the Oslo Stock Exchange and is therefore a good proxy for the Norwegian stock market. For industry-specific trends, there are unfortunately no companies listed in Norway with a similar business model to REC Silicon, and it is therefore necessary to look abroad. Although it is hard to find a company that reflects RECSI to a satisfactory degree, Wacker Chemie AG (WACKER) makes for a good candidate. Like RECSI, the company operates in the solar market outside of China, with core operations focused on the production of polysilicon and other semiconductors (Wacker Chemie AG, 2023).

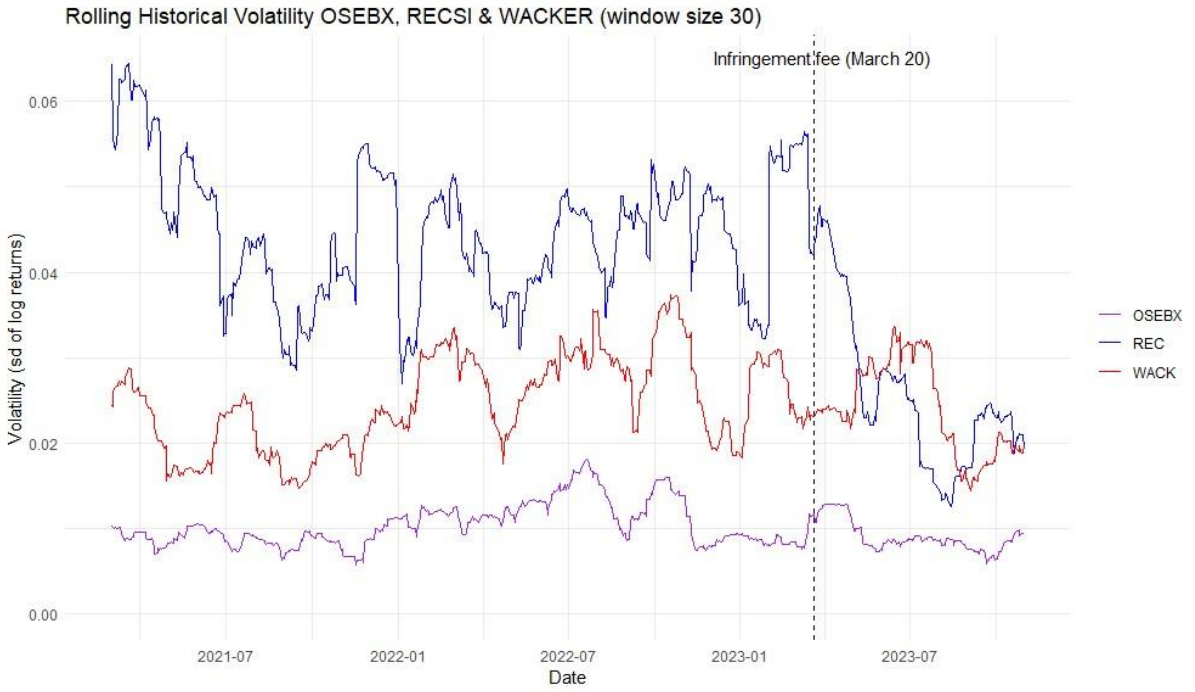


Figure 6 – Rolling 30-day historical volatility of RECSI, OSEBX and WACKER between 01.03.2023 and 31.10.2023. The dotted line represents March 20, 2023. Data source: (Yahoo! Finance, 2023)

Figure 6 shows the rolling 30-day historical volatility of OSEBX, RECSI and WACKER, with the date of the infringement fee indicated by the dotted line. The volatility of OSEBX is quite stable through the entire period, with some fluctuations, and indications of a slight downward trend after March 20, 2023. The volatility of WACKER is more unstable, but also indicates a slight downward trend after March 20, 2023, that is steeper than what we see for OSEBX. When comparing RECSI to OSEBX and WACKER, the relative change in volatility is, however, significantly more substantial for RECSI. While there are indications of negative trends in volatility both for the Norwegian stock market and the polysilicon industry, the substantial change in volatility of RECSI can at best only partially be attributed to market or industry trends.

Company-specific news can also impact volatility. On January 31, 2023, REC Silicon announced a *"10-year take-or-pay supply agreement for high purity granular polysilicon produced from REC's facility at Moses Lake, Washington"* estimated at USD 3 billion, with their largest shareholder Hanwa Solutions (REC Silicon, 2023). The contract gave a strong signal that the factory would be reopened, thereby eliminating a lot of uncertainty in this regard. Although the news was directly followed by a sharp spike in both price and volatility, the long-term implications of reduced uncertainty about the company's future can help explain a decrease in volatility in the months following the initial spike.



Figure 7 - Immediately following the news of the contract, RECSI's price increased drastically. The closing price on February 1, 2023, was NOK 17.70, an increase of 25% from the closing price of NOK 14.15 on January 31, 2023. Short-term this explains a spike in volatility. Long-term decreased uncertainty about the future can explain a decrease in volatility.

The nature of excessive wash trading should, by definition, lead to increased volatility. This is supported by the fact that the substantial decrease in volatility directly coincides with Pedersen stopping this kind of trading behaviour. The substantial decrease may however also be largely attributed to external factors such as market trends, industry trends, and company-specific news. While there is reason to believe Pedersen's wash trading potentially led to increased volatility in RECSI during the manipulation period, it is close to impossible to estimate the exact impact, as the decrease of volatility in the period following the infringement fee, may largely be attributed to external factors.

6 Investigating the Effects of Pedersen's Trades on Volume

Volume is an important metric for trading and gives information regarding the liquidity of a security. For someone who values the opportunity to get in or out of positions quickly without moving the price substantially, volume in a security can play an important role when deciding whether to take a position. If the volume in a security is high, the spread is typically low, and there are ample willing buyers and sellers in the market, making quick entries or exits relatively cheap.

6.1 Wash Trading and Artificial Volume

When two consenting parties execute a trade of a security at a given price and quantity, the ownership of the security changes hands from the seller to the buyer, while compensation for this (usually money) moves from the buyer to the seller. All information regarding the trade is provided to the market at the time of execution, with the sole exception being the identity of the buyer and seller. This information is important, and among other things gives indications of buy or sell pressure in the market of the specific security.

An important distinction between two separate parties executing a trade, and one person executing a wash trade with himself is that for the latter there is no real change of ownership. However, as the market is not informed of the identity of either buyer nor seller, there is no way to distinguish between a wash trade and a regular trade. Only the wash trader has this information. What makes wash trading problematic is that due to the lack of change in ownership, this is no more an actual trade than a person taking a 100-dollar bill from the left side of his wallet and placing it in the right side of his wallet. An important consequence of this is that the volume reported to the rest of the market is not real, but artificially engineered volume created by the wash trader to give misleading information to the rest of the market.

Between March 1, 2021, and December 1, 2022, Pedersen performed a total of 4,550 trades in RECSI between himself and his company Dichesbuen, spread across 116 of the 445 trading days in this period. On every single one of these days, the turnover from the wash trades accounted for more than 10% of the daily turnover, for a total turnover of NOK 4.65 billion. Assuming an average price of about NOK 17.00, this equals a volume of more than 273 million stocks across the period, or about 2.35 million stocks on average for each of the 116 days. All of this is a result of wash trading, and therefore artificial volume.

This is a staggering number and is more than sufficient to give misleading indications of the actual trading volume in RECSI. Consequently, this type of wash trading, will to many other traders substantially increase the attractiveness of the stock. Imisiker and Tas state that *"By conducting wash trades, a manipulator attracts the attention of some information seekers to the market of the stock and affect their investment decisions"* (Imisiker & Tas, 2018). Therefore, it is reasonable to believe that the wash trading nudged other participants in the market to take positions in the stock, starting a snowball effect. We can state, without any doubt, that the volume has increased by an amount equal to that of all the wash trades, and most likely even more.

6.2 Not only Wash Trades

In addition to wash trades, Pedersen has traded substantially with the rest of the market during the period. Frankly, anything else would not have made sense, but it is an important point. Data from Tekinvestor.no provides an overview of net changes in Pedersen's and Dichesbuen's portfolios. Using this data, we can track the total asset holdings in RECSI on a day-by-day basis. As the raw data is provided on a T + 2 trading days basis, it is important to emphasise that in the following figure, we have adjusted for this.

Figure 8 shows the aggregate asset holdings of Dichesbuen AS and Pedersen in RECSI. The figure clearly illustrates that there have been made trades of rather large volumes, where the aggregate asset holdings change substantially. As wash trades have a net-zero effect on aggregated asset holdings, this is evidence that Pedersen frequently traded substantial volumes with other players in the market during the period. It is important to emphasize that the data from Tekinvestor.no only portrays the net changes in the portfolio at E.O.D. Net changes only describe the difference in asset holdings between B.O.D. and E.O.D. Any positions acquired and subsequently liquidated during the day, are therefore not incorporated, and net changes are therefore the lower bound of Pedersen's daily trading volume. In reality, Pedersen may have traded much larger volumes than this.

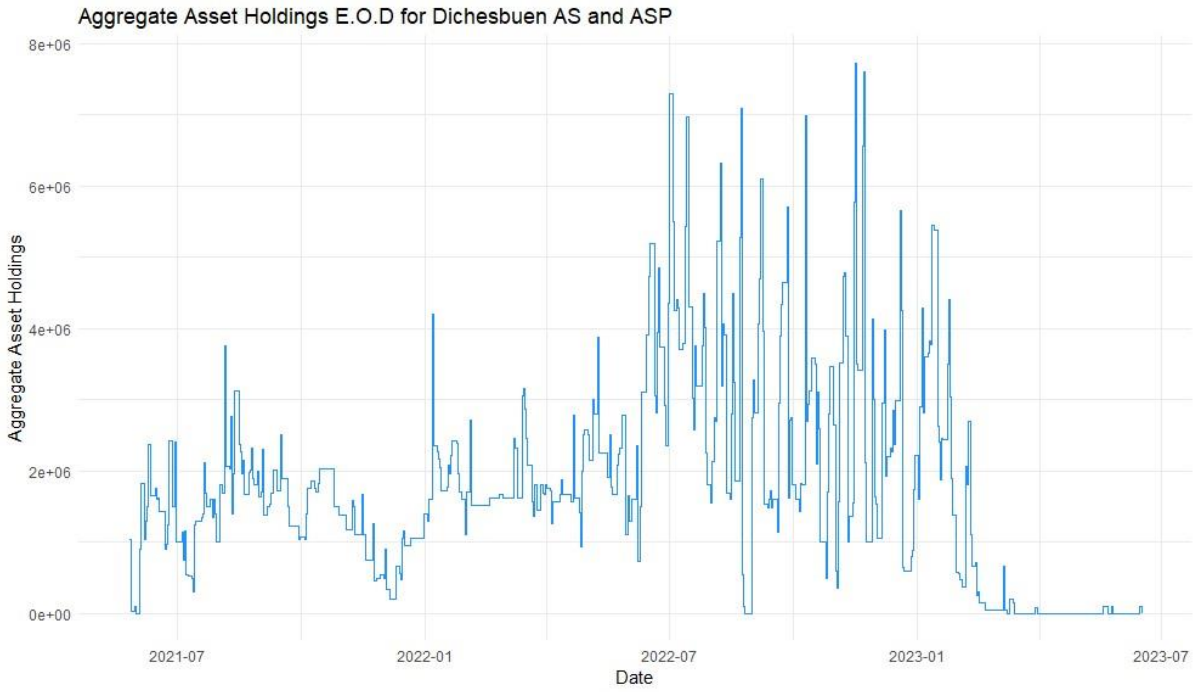


Figure 8 - Aggregate asset holdings (RECSI) Pedersen and Dichesbuen at E.O.D.

6.3 Aftermath

Following the infringement fee on March 20, 2023, and the case becoming public on March 29, 2023, there has been a substantial and seemingly permanent change in RECSI trading volume as illustrated in *Figure 9*. From April 2023 and onwards, no single month has seen trading volume even remotely close to any of the months in the period before. From March 1, 2021, to March 31, 2023, the average monthly trading volume in RECSI is approximately 165 million stocks. From April 1, 2023, to October 31, 2023, the average trading volume was 26.6 million stocks, indicating a decrease in monthly trading volume of about 84%. Simply by removing Pedersen's wash trading and real market trading from the equation, one would not expect a decrease in trading volume to this extent. Evidence suggests that the volume change far surpasses the footprint of Pedersen alone and indicates that many of the other players in the market have also stopped or reduced their trading activity in RECSI.

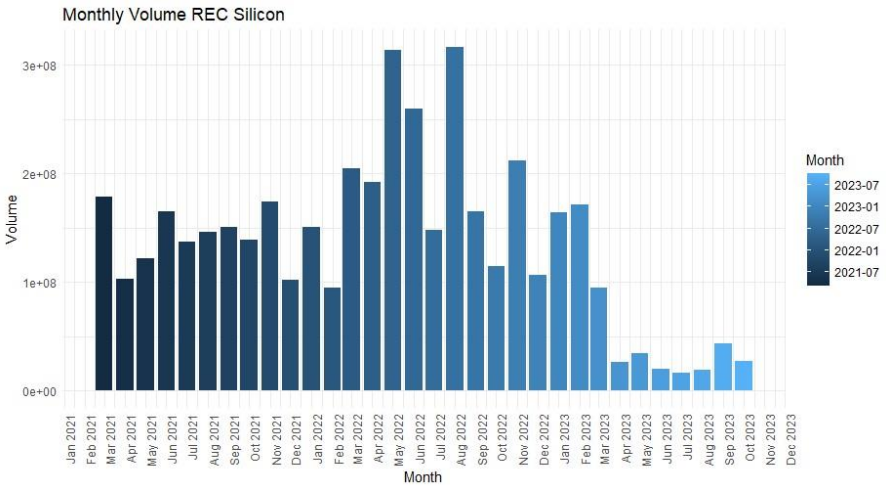


Figure 9 - Monthly Volume RECSI ranging from March 2021 to October 2023. Data source: (Yahoo! Finance, 2023).

It is hard to see how one event alone could yield such a drastic effect on trading volume. To explain the change, we believe that this is the result of several factors. (1) The abrupt end to Pedersen's wash trading has removed the artificial volume created in the stock. (2) Furthermore, we notice that from the aggregate asset holdings that Pedersen has also most likely stopped trading in RECSI altogether, as there are close to no net changes in his asset holdings. (3) The combination of the removal of both the artificial and real trading volume caused by Pedersen have most likely had a self-reinforcing effect on volume. As other traders see decreasing volume, the stock is no longer as attractive, and this can have led to several other investors deciding to stop or reduce their trading activity in RECSI. (4) Macroeconomic factors such as increasing interest rates may cause some investors to look to other financial markets, such as the bond market, as an alternative to the stock market. As shown in *Figure 10*, there has been a dramatic increase in interest rates in Norway since the end of 2021. (5) Finally, the case becoming public through the Norwegian media potentially had a negative effect on the reputation of RECSI, which could explain why some investors might be hesitant to trade in the stock. Without being able to quantify exactly how much Pedersen's wash trading has impacted the volume of RECSI, the analysis quite clearly shows that he has had a significant impact.

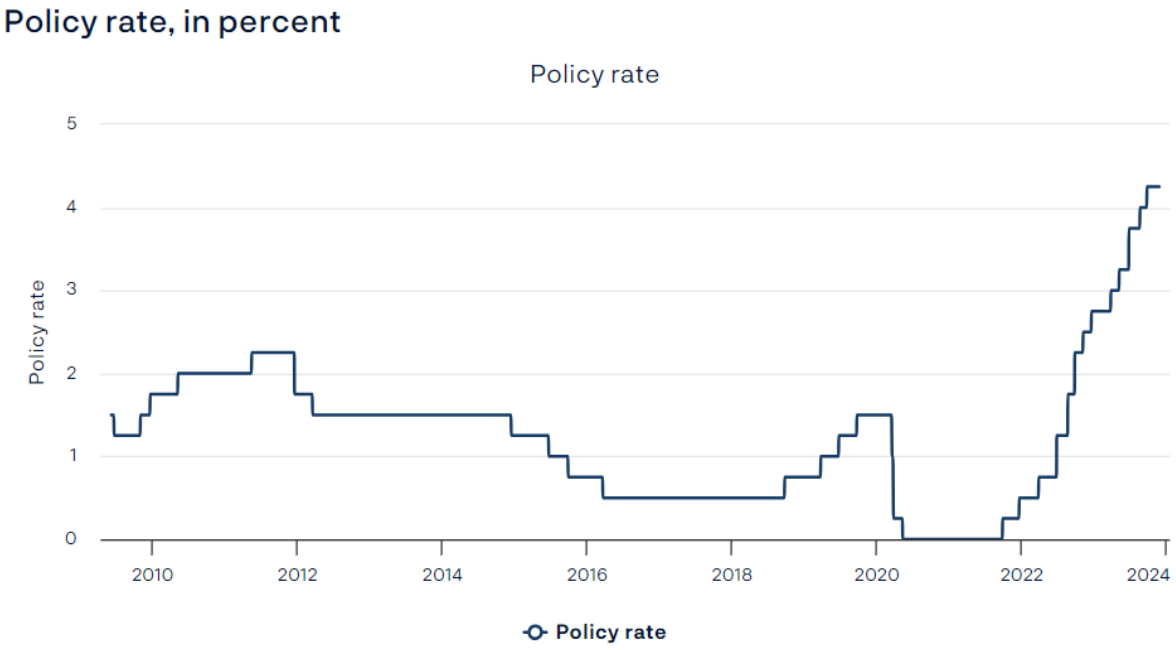


Figure 10 - Norwegian interest rate levels from 2008 to the present (November 2023). Source (Norges Bank, 2023)

7 Reflections and Conclusion

7.1 Reflections on the Consequences of Pedersen's Trades

The impact of Pedersen's wash trading on the price, volatility and trading volume of RECSI has consequences reaching beyond just Atle Sandvik Pedersen and the infringement fee.

Most financial markets can be categorized as a degree of semi-strong form efficient, meaning, in short, that prices include all publicly available information and adjust rapidly to new information (Chen, Semi-Strong Form Efficiency: Definition and Market Hypothesis, 2022).

Engineering artificial price movements in RECSI through wash trading provides the market with misleading information, negatively impacting price discovery making it increasingly difficult to discover the *"correct"* price. As a result, the price found by the market contains false information, making the market for RECSI less efficient.

For REC Silicon ASA, the aftermath of the Pedersen case and the resulting sharp decrease in trading volume has ultimately led to the company being removed from the OBX index, which lists the 25 most liquid companies on the Oslo Stock Exchange, on September 18, 2023 (Nordnet, 2023). In this regard, it is important to note that several financial institutions are obligated to hold portfolios representing the composition of certain indexes, such as the OBX. As a result of being omitted from the OBX, companies that are committed to the OBX index are no longer obligated to hold RECSI, which can have a further negative effect on the trading volume and turnover of the stock. It can also be noted that there is a certain prestige associated with being part of the OBX index.

Furthermore, while having done nothing wrong, REC Silicon has received a lot of indirect negative press coverage because of the Pedersen case, and in many eyes the stock will, at least in the medium term, be associated with market manipulation.

On the other hand, the consequences have not necessarily always been of a negative nature. For day traders and other players in the market, such as Johannes, who have been able to identify the price pattern created by Pedersen, the case may have provided profitable opportunities. The important distinction is that these traders have not taken part in the market manipulation, but they may still have been able to take advantage of the price movements Pedersen engineered. As Johannes put it, *"For my part, it should not be understated that if Pedersen was allowed to continue and he continued to this day, I would have made more money this year than I have. So, for me personally, it's bad because then I can't take advantage of artificial changes, but for the average Joe, who has their savings in a stock, it will be a reassurance that the stock isn't suddenly artificially manipulated"*.

7.2 Conclusion

In the beginning of this paper, we raised the question: *"How has Atle Sandvik Pedersen's extensive self-trading affected prices, volatility and trading volume of the REC Silicon ASA stock?"*

To answer it, this term paper has analysed the impact of Pedersen's trading behaviour. In conclusion, Pedersen has, through extensive wash trading, been able to engineer artificial price movements in RECSI. By the nature of his trading methods, it is reasonable to believe that his trading has contributed to artificially high volatility. The extent of this contribution is, however, difficult to quantify.

While it must be noted that Pedersen has traded a significant volume with the rest of the market, he has also provided large quantities of artificial volume from trading with himself. This artificial volume has substantially inflated the overall trading volume of RECSI, potentially making the stock more attractive to other investors. After he was caught, the average monthly trading volume of RECSI has seen a dramatic fall, although some of the effect can be attributed to external factors.

Pedersen's trading behaviour has had negative consequences for REC Silicon ASA and has contributed to decreasing the market efficiency for RECSI.

While TFSAN could not prove that Pedersen made any profit from his wash trading, the authors of this term paper find it quite conspicuous that during the same period, he has (1) been able to use wash trading to engineer artificial price movements in RECSI, (2) traded significantly in RECSI with the market and (3) delivered profits after taxes of NOK 20 million (Proff.no, 2023) through his company Dichesbuen AS alone.

8 Bibliography

Aggarwal, R. K., & Wu, G. (2006, July). Stock Market Manipulations. *The Journal of Business, 79 (4)*, 1915-1953. doi:https://doi.org/10.1086/503652

Burkacky, O., Dragon, J., & Lehman, N. (2022, 04 1). *The global semiconductor industry is poised for a decade of growth and is projected to become a trillion-dollar industry by 2030.* Retrieved from McKinsey & Company: https://www.mckinsey.com/industries/semiconductors/our-insights/the-semiconductor-decade-a-trillion-dollar-industry

Chen, J. (2022, May 19). *Semi-Strong Form Efficiency: Definition and Market Hypothesis*. Retrieved from Investopedia, homepage: https://www.investopedia.com/terms/s/semistrongform.asp

Chen, J. (2022, September 30). *Wash Trading: What it is and how it works, with examples*. Retrieved from Investopedia, homepage: https://www.investopedia.com/terms/w/washtrading.asp

eInnsyn. (2023, November 21). *Markedsmanipulasjon, MAR artikkel 15. Case no. 2022/6527*. Retrieved from einnsyn.no: https://einnsyn.no/saksmappe?id=http%3A%2F%2Fdata.einnsyn.no%2Fnoark4%2FSaksmappe--840747972--6527--2022

Harris, L. (2003). *Trading & Exchanges.* Oxford: Oxford University Press.

Imisiker, S., & Tas, B. K. (2018, December). Wash trades as a stock market manipulation tool. *Journal of Behavioral and Experimental Finance, 20*, 92-98. doi:https://doi.org/10.1016/j.jbef.2018.08.004

Kong, D., & Wang, M. (2014, March-April). The Manipulator's Poker: Order-Based Manipulation in the Chinese Stock Market. *Emerging Markets Finance & Trade, 50 (2)*, 73-98. Retrieved December 5, 2023, from http://www.jstor.org/stable/24475662

Nordnet. (2023, September 7). *Børs: GJF, NAS og Hauto inn i OBX, MPCC, Kahoot og RECSI går ut*. Retrieved from Nordnet.no: https://www.nordnet.no/market/news/1008372397

Norges Bank. (2023, December 5). *The policy rate*. Retrieved from Norges Bank, homepage: https://www.norges-bank.no/en/topics/Monetary-policy/Policy-rate/

Olsvoll, I. L. (2011, 10 21). *Bergens 100 rikeste*. Retrieved from Bergensavisen: https://www.ba.no/skatt/bergens-100-rikeste/s/1-41-5778041

Proff.no. (2023, 11 22). *Dischesbuen AS*. Retrieved from Proff: https://www.proff.no/aksjon%C3%A6rer/-/dichesbuen-as/913061500

PVTime. (2023, 08 21). *1.5 Million Tonnes of Polysilicon! Massive New Capacities in China Support PV Growth Globally 2023*. Retrieved from PVTIME: https://www.pvtime.org/1-5-million-tonnes-of-polysilicon-massive-new-capacities-in-china-support-pv-growth-globally-2023/

REC Silicon. (2023, 11 22). *About us: REC Silicon*. Retrieved from REC Silicon: https://recsilicon.com/about-us/

Risbakken, K. (2022, 08 22). *Nettmeglerne gikk varme i Rec-aksjen: – En fantastisk investering, sier bergensinvestor*. Retrieved from dn.no: https://www.dn.no/marked/rec-silicon/nettmeglerne-gikk-varme-i-rec-aksjen-en-fantastisk-investering-sier-bergensinvestor/2-1-1279913

Settem, B. E. (2023, 03 08). *Kvinner eier mest Equinor, menn eier mest Tesla*. Hentet fra Nordnet.no: https://www.nordnet.no/blogg/kvinner-eier-mest-equinor-menn-eier-mest-tesla/

Simply Wall St. . (2023, 10 24). *REC Silicon ASA (OB:RECSI): Is Breakeven Near?* Retrieved from Simply Wall St.: https://simplywall.st/stocks/no/semiconductors/ob-recsi/rec-silicon-shares/news/rec-silicon-asa-obrecsi-is-breakeven-near

Solar Energy Technologies Office. (2023, 11 23). *Federal Tax Credits for Solar Manufacturers*. Retrieved from energy.gov: https://www.energy.gov/eere/solar/federal-tax-credits-solar-manufacturers

Tekinvestor.no. (2023, November 18). *Atle Sandvik Pedersen*. Retrieved from Tekinvestor, homepage: https://tekinvestor.no/aksjonaer/1164100

Tekinvestor.no. (2023, November 18). *Dichesbuen AS*. Retrieved from Tekinvestor, homepage: https://tekinvestor.no/aksjonaer/b-913061500

The Financial Supervisory Authority of Norway. (2022, November 13). *Markedsmisbruksforordningen (MAR)*. Retrieved from The Financial Supervisory Authority of Norway, Norwegian Homepage: https://www.finanstilsynet.no/tema/markedsmisbruksforordningen-mar/

The Financial Supervisory Authority of Norway. (2023, March 20). *Vedtak om ileggelse av overtredelsesgebyr*. Retrieved from The Financial Supervisory Authority of Norway: https://www.finanstilsynet.no/contentassets/b87b16575dca4293a97e179f527ca50a/vedtak-om-ileggelse-av-overtredelsesgebyr---markedsmanipulasjon.pdf

Thompson, C. (2023, 10 21). *Semiconductors' Impact on the Stock Market*. Retrieved from Investopedia: https://www.investopedia.com/semiconductor-impact-on-the-stock-market-7497739

Wacker Chemie AG. (2023, December 5). *About WACKER*. Retrieved from Wacker Chemie AG, homepage: https://www.wacker.com/cms/en-us/about-wacker/wacker-at-a-glance/profile-and-organization/wacker-polysilicon.html?fbclid=IwAR2EGvm2TCNrbsJD-9Aj-ovRWQdG5nUfv6-V7RB_LwMliMk3V3qnWn_B4JM

Yahoo! Finance. (2023, November 18). *REC SILICON ASA (RECSI.OL)*. Retrieved from Yahoo! Finance, homepage: https://finance.yahoo.com/quote/RECSI.OL/history?period1=1614556800&period2=1698710400&interval=1d&filter=history&frequency=1d&includeAdjustedClose=true

9 Appendix

9.1 Intraday Stock Price and Trading Volumes for RECSI

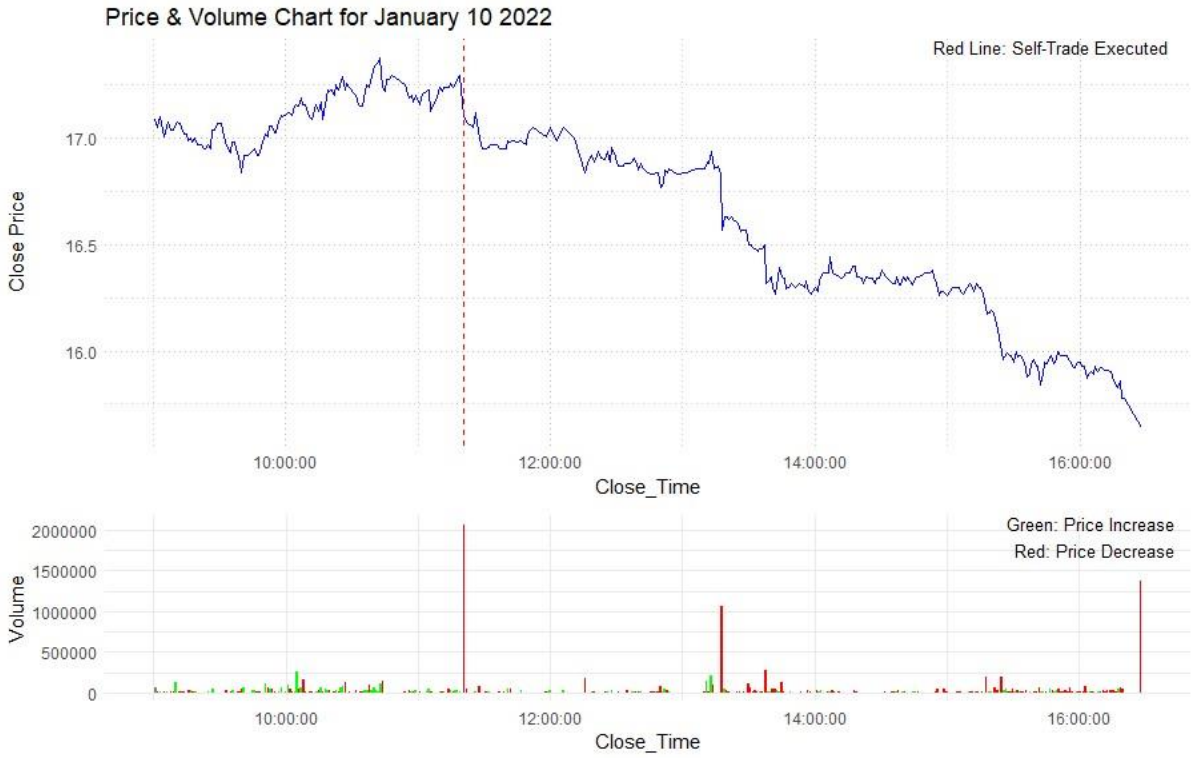


Figure 11 - Price & volume chart January 10, 2022



Figure 12 - Price & volume chart March 23, 2022

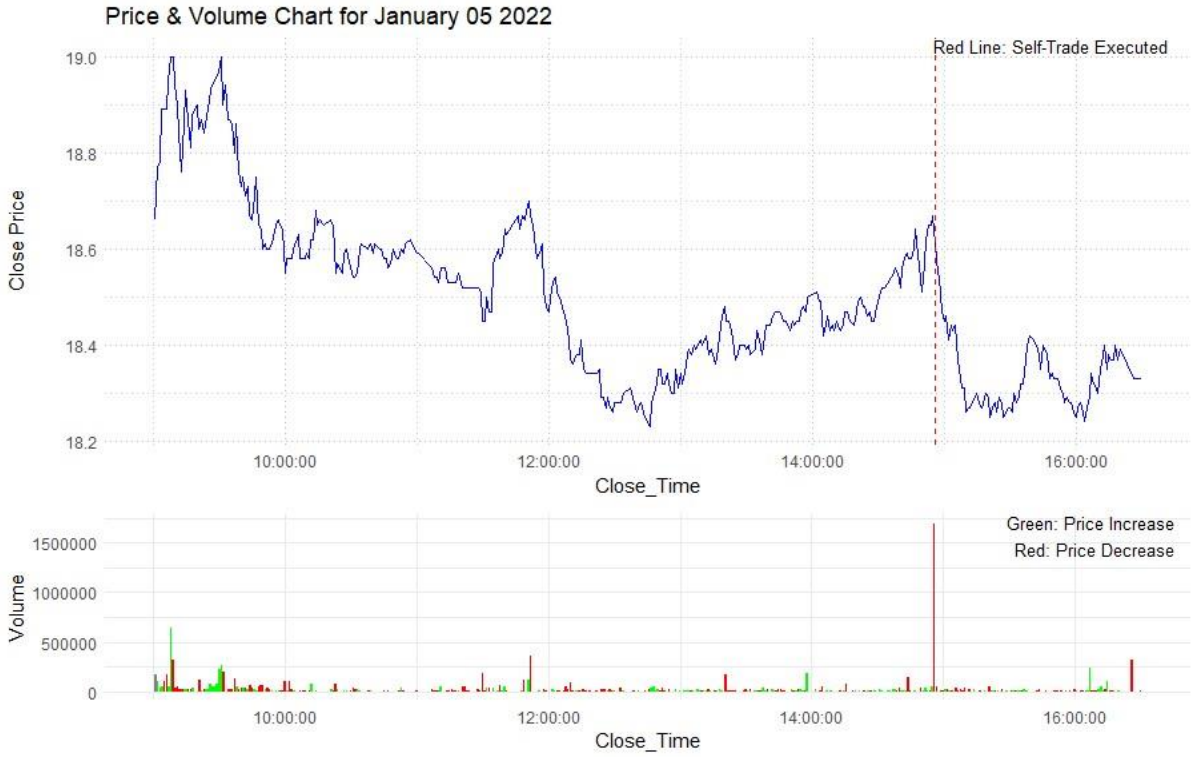


Figure 13 - Price & volume chart January 5, 2022

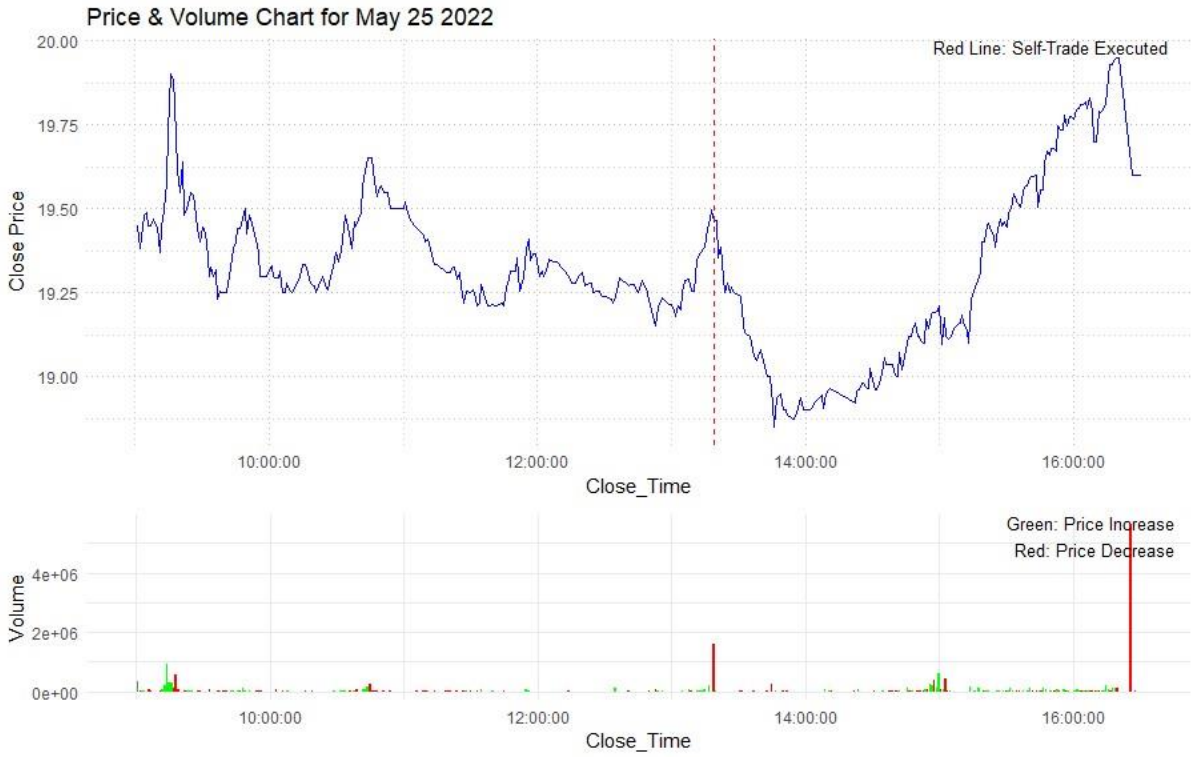


Figure 14 - Price & volume chart May 25, 2022

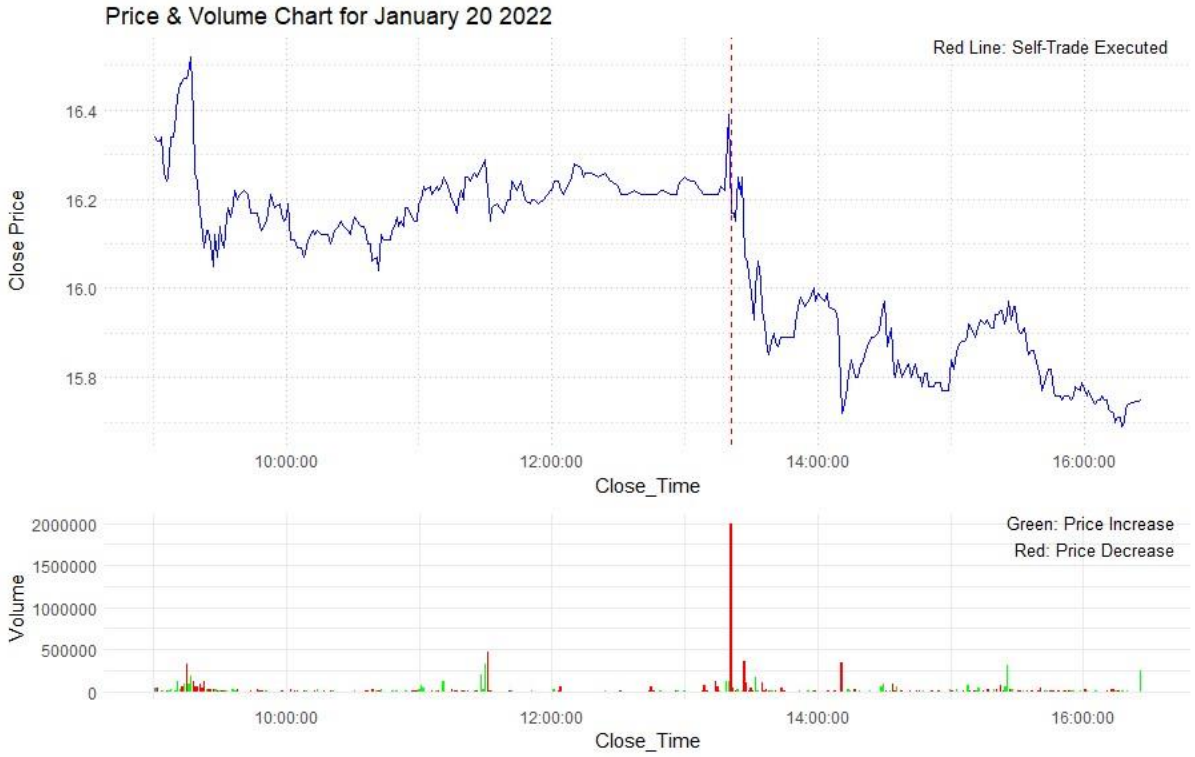


Figure 15 - Price & volume chart January 20, 2022

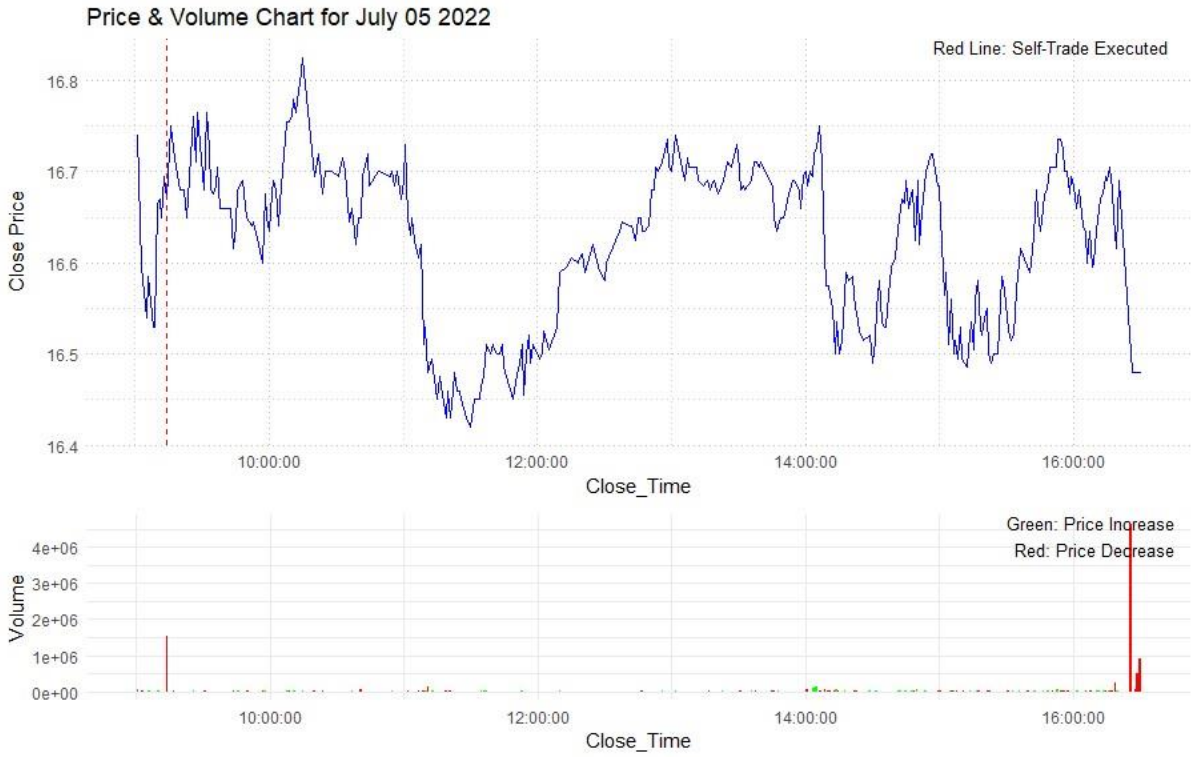


Figure 16 - Price & volume chart July 5, 2022



Figure 17 - Price & volume chart October 13, 2021

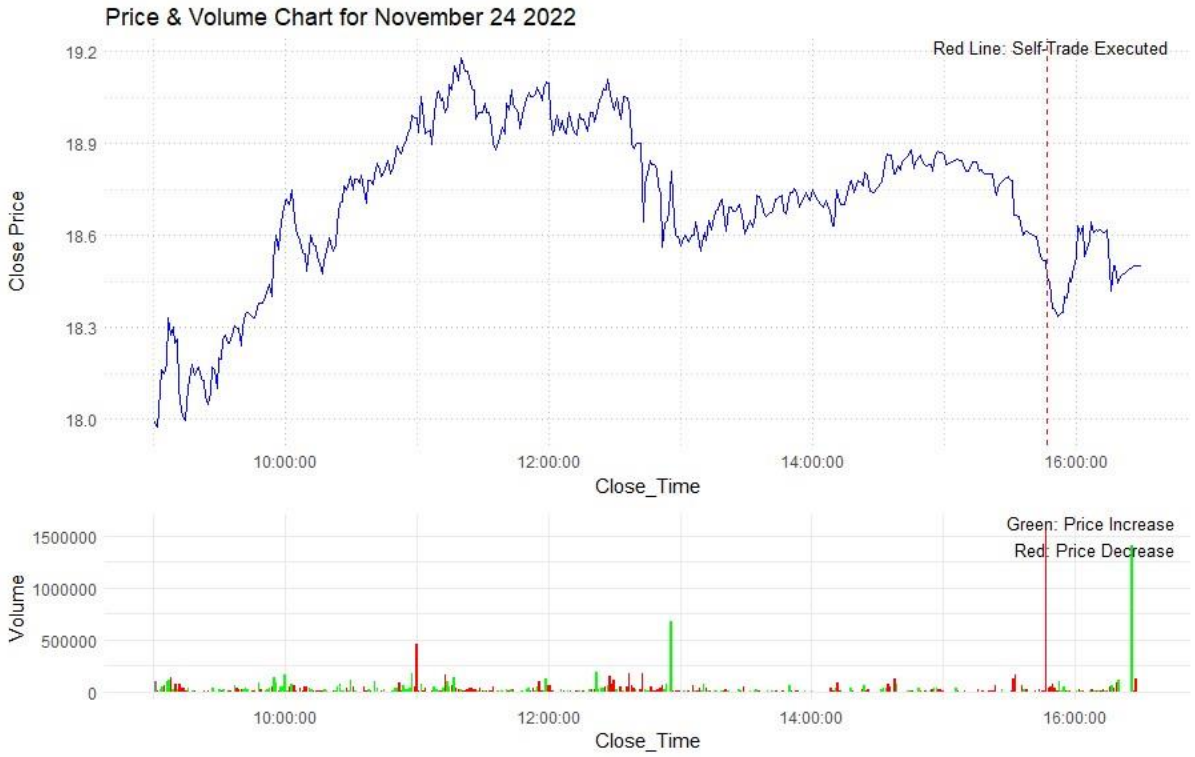


Figure 18 - Price & volume chart November 24, 2022



Figure 19 - Price & volume chart November 11, 2021



Figure 20 - Price & volume chart May 13, 2022

9.2 Interview with “Johannes”

Can you describe who you are and what you do?

A 26-year-old man married and expecting a child. I trade stocks for a living.

How long have you been doing this?

I've been doing this full-time for three years.

To what extent do you use automated/algorithmic trading?

None, everything I do involves manual orders that I submit. If I use a stop-loss, it's just as a safety net in case I'm busy and doing something other than trading.

Do you have any relationship with RECSI?

It's a very exciting stock that has incredible fluctuations when there's high volume. It's almost obvious to me that it has gone through a lot of price manipulation and has a high number of small investors who aren't mentally where they should be for trading on the stock market.

How often do you trade, and what perspective do you have on the trades you make?

It varies. I have both long- and short-time horizons. I have a portion that I trade in the short term: this can be intraday, it can be swing trading on a daily and weekly basis, it can be for several weeks, and then I have a portion of my portfolio that lies in a long horizon. If I suspect that there will be turbulence in the market, I might try short-term trading with all/most of the long-term portion.

How often would you say you specifically trade in RECSI?

Daily, usually daily.

When you trade intraday, what do you trade on?

Mostly technical factors, but you can build up different patterns based on different types of news. For example, RECSI on quarterly reports, when there have been good news/expected news, it has fluctuated incredibly much, often going up initially and then dipping quickly. It can be seen as a mix between trading on news and technical factors. At least I know the pattern very clearly and can predict, with good results, what will happen in the next few minutes and hours.

When you choose which stocks to trade in, what characteristics are important to you in a stock?

It's important that there's high enough volume, so that if I want to get out, I can do so relatively quickly. Also, it's important that there's enough fluctuation and uncertainty in how the stock is priced, which results in a volatile stock.

My number one priority is security through volume, meaning there's constantly enough liquidity offered that if I want to sell a whole position, I don't lose many percent. Number two is that the stock is volatile.

How does your trading strategy work, what factors do you consider when making a decision?

Comparing patterns against historical events and historical patterns. Then I look at how it tends to move when various factors come into play. So, it becomes a "gamble" with a good basis. A

relatively carefully considered "gamble". You can never be completely sure, but when you do it every day and have a good memory and pattern recognition ability, there's a lot that "makes sense". It's a "hunch" with a logical reason.

You mentioned earlier that you have traded a lot in RECSI, how long have you been doing this?

I've been doing this since late 2020.

When you decided to start trading in RECSI, what made it attractive to you?

What first made it attractive was that before Røkke entered it, it was a stock that I started to investigate long before I began trading in it.

There was a lot of speculation about the stocks, so I started to investigate the speculations, to see whether or not there was any truth in them. The downside was quite low, and the upside was incredibly high in my opinion. So, I took some "tickets". That was my first trade in RECSI. Then it started to become a Reddit stock/Discord stock/Tiktok stock. As a consequence, a lot of volume came from small investors, and it started to fluctuate wildly. Then I realized that I could be colder than the market, and trade without being driven by emotional factors, and simply look at technical factors. After that, I became more and more interested because it was a stock that was easy to make money in.

Would you say that high volume, high volatility and fluctuations played a big part in you starting to trade in it?

Yes, and there you have RECSI in a nutshell. It has been an enormously volatile stock with very high volume.

Can you give some good reasons or examples of why RECSI has been a good stock to trade in, from your perspective?

Yes, I can mention for example in 2021, the price was dumped down to the 12-range and was sluggish. Then, news about the Hanwa acquisition arrived and the price was almost doubled in just a month's time. Similar patterns have happened repeatedly. That strengthens my belief in my long-term position. It is also possible to recognize patterns from all those smaller investors who get really hyped up. When this happens there's high volume in a short time, short sellers sell out quickly. Then there's a small correction, and then everyone starts to "pee in their pants", and then they pump them out again. It's a standard pattern you can recognize that makes RECSI very attractive.

Earlier this spring, there was a big case in the media regarding market manipulation of the REC stock caused by the Bergen investor Atle Sandvik Pedersen. To what extent are you familiar with this case?

I haven't read everything he has been convicted of, but I am aware of the case.

Was this the first time you became aware of this?

No, not at all. I've openly talked with my friends about it for fun, and then it later came out. I was aware that this was going on for a long time and was surprised that he was allowed to continue for so long.

Could you see indications of manipulation in RECSI before the case became public, and could you identify who was behind it (Dichesbuen/ASF)?

Yes, you can identify that. In the beginning, you couldn't identify who was behind it as much. But right at the start, you could go back and look at shareholder changes. You could see that Dichesbuen AS, which is Pedersen's investment company, and his private ASK (*Norwegian stock savings account*) called "Atle Sandvik Pedersen". You could see that time and again the stock holding in one increased while the other decreased on the same day. This happened many times, then you can look back two days in time and see that there were typical patterns, especially in the closing auction, but also intraday that suddenly there are large posts that go in at the same time. You can't prove it from what I saw, but there are incredibly strong indicators and it's incredibly striking that every time there are news about changes in shareholder holdings, and then looking back two days when the price change most likely happened.

You mention closing auctions, but in the TFSAN report, it only mentions trades that occur intraday. Could it be that there have been more wash trades than TFSAN has been able to pick up in precisely the closing auction because there will always be multiple buyers and sellers on each side of the orderbook in any closing auction?

Yes, I think that might be the case, and then there are many who do things differently. With having cooperation without owning both ends, I don't think it's just him who does self-trading to manipulate the price.

Is this an observation you discussed with others when it happened, or have you seen that it has been discussed?

I have seen that it has been discussed, I am not a forum (Reddit/Discord) trader, but I like to investigate it to get a feel of the temperature in the market. I do that to include it in my analysis of where people are mentally in this stock from day to day. If there's a lot of cheering and the price has increased a lot and I see changes in volume and suddenly a couple of "hammers". Then I can think that OK, now people are buying for all their money, and think that shortly the price will go down. Then I can do the same closer to the bottom, when people get angry and start to complain. Then I have often seen self-trading being discussed, and many blamed one thing or another, but mostly Pedersen.

You often mention "hammers", what do you mean by that?

When I say hammers, I point to large posts that significantly influence the price. If there's a post that contain many shares, where the seller of the post has set the selling price low, many orders are eaten at the same time and the price goes down, sometimes by several percentage points. So, these are large trades that drive the price in a specific direction, either up or down.

What has driven the price down isn't necessarily just small trades that create a gentle downhill slope, RECSI tends to have many "hammers" meaning that there are large orders that are filled, where sellers of the orders are willing to sell for significantly lower price than the current stock price.

Based on the case, how has this affected your trading pattern? Has this led you to change the way you trade?

Yes, to a small extent, however my trading pattern is mostly the same. But I notice clearly that there's much less volume in the stock, and there are some days where there are so few fluctuations that I sit relatively quieter and have significantly fewer stock trades in RECSI. More specifically on days when there has been self-trading: If I see a hammer, I often become a bit hesitant to buy as I suspect it will create an immediate negative reaction. Usually, it has gone up after a short time, but one hammer is often followed by another.

Would you say this has been exclusively negative, or have there been positive consequences seen from your perspective as a day trader?

From my selfish perspective, it has largely been positive, because then one can trade stocks at what I believe is an artificially low price in the market, because the "hammer" has created a price that is potentially a two-digit percentage lower than the fair price was just before the hammer hit. Historically, it has always come back.

Who do you consider to be the biggest losers/winners as a result of this case?

The winners are those who engage in self-trading if they are not caught doing it. Because they know exactly what is happening and they have very little doubt within the market and must ponder less than many others have to. They dare to take a bit bigger risk because they know what is happening. Also, for those who have ice in their stomach, and see a bit of pattern, it's easy to make good money when the price suddenly drops a bit.

Do you believe that small investors who do not trade as often as a trader who trades daily in the stock, will perform worse?

If it is a small investor who has a long-term perspective in RECSI, who has a small sum invested, there are several peaks one could have withdrawn their money, and a month later invested them at a 40-50% lower sum. For those who sit often and recognize patterns and manage to sell near the top and buy near the bottom, they have increased their stock holdings much more than the small saver who just sits still.

What other consequences do you think Pedersen's illegal activity might have had on the market and its participants?

What I am thinking is that when he was caught, you can see that the volume has gone down significantly in RECSI. I suspect that has several effects. It becomes a snowball effect: He caused a lot of volume into the stock which made many able to trade and do well in the stock. Because of this, it becomes an attractive stock, but when he was caught for it, I think there are many who might be in the same boat as him, who also might either have taken advantage of his price manipulation or were engaged in price manipulation themselves who got a bit reluctant. Thus, the stock becomes a bit less attractive. Then it continues to roll, since it is not as attractive and does not have as much volatility, there are fewer who trade in it.

Has not much fundamentally changed with the company, besides less price manipulation?

What has fundamentally changed with the company, unlike in 2020/2021, when there were rumors and there was excitement around it, things have been concretized. They have opened their factory in Moses Lake, and they report that everything has gone according to the budget and timeframe they have set. It's just a matter of time now until they start making money.

Fundamentally, the stock has strengthened since Pedersen was active, while the stock price has been flat and slightly declining, seen in the big picture.

As a market participant who is quite active, when the market learns that there has been manipulation in the market, do you think the news itself can make the stock itself become a bit ostracized?

Yes, I mean I think some think that way. I don't think that way, I understand why some would think that. I think that in the long perspective, the stock will become healthier after the price manipulation became known and it was stopped, I think the stock will become healthier after a while and it will take a little shorter time before the real values come forward. The fact that someone wants to manipulate a stock, I think is because there is something positive in the stock, which one can play on and that many small, private shareholders who are on board with the idea and thus find it an attractive stock. So, I think in a way it can go both ways, but for my part, the fundamentals in the stock or the company itself have not become less attractive due to the price manipulation.

To what extent do you think the other market participants had a suspicion of market manipulation before the case became known?

When I started to suspect it in 2021/2022 and then read that many small investors were talking about this and that regarding Pedersen, it would surprise me a lot if the larger players knew it long before I did.

Would you say that this perception was evenly distributed among all the participants in the market, or perhaps especially for those who trade a lot and often in the stock? Thinking particularly of for example small investors who maybe do not trade as often in the stock, and do not necessarily have the time and resources to keep up to date on news around RECSI (on a daily basis).

Yes, I would think so. Small savers are screaming at the top of their lungs that market manipulation is happening. My logic suggests that if small savers knew it, then the larger players, especially those who are more involved in RECSI knew this to a greater extent. Maybe they did not bother to scream at the top of their lungs because they knew that this would pass, and they understood more about the "game". So, I would think that everyone had an opinion about it.

The case became publicly known on March 29 this year (2023). Has the fact that the case became publicly known had an impact on you and your trading? Do you still trade in REC stock today?

Not the case itself, but the aftermath of him most likely having stopped trading RECSI, has had an impact on my trading. He had a big impact on how much volume there was, he added a lot of volume himself and created ripple effects by creating fluctuations that others would jump on. When he steps out, other people will tread a little cautiously, maybe some become a little sceptical of the stock itself, maybe others who have engaged in similar activities become a little anxious. Then the total snowball effect will make the volume smaller, thus changing my trading pattern.

Have you noticed any changes in trading patterns in the period after the case was made public? Do you have any thoughts on what might be the reason for this?

Yes, there are much fewer fluctuations and much less volume. This is probably because the whole snowball effect is stopped. He does not add volume, there may be some scepticism tied to the stock. When there is no volume and there is scepticism, in the stock, it could be that traders think that then I'll drop RECSI for the moment. When enough people have that kind of attitude towards a stock, the snowball effect will go the opposite way.

Since you have followed REC for a long time, what do you think the aftermath of Pedersen's manipulation has had on the stock in the long term?

I think it will have very little to say in the long term. For sooner or later, the real values will show, and the day RECSI shows quarterly reports with exclusively positive earnings and things are going quite well, I think the concrete will become a bit too much for a medium-sized investor like Pedersen. It becomes a bit too much for the Pedersen-effect to take hold of that. There comes a point where large investment-funds have clear signs to act on, and thus can trade in the stock according to their own rules. Then things will probably become so concrete that the stock will get a much better footing and will react much better and stronger to attempts at manipulation. The long-term effect I think will be quite similar.

You say the volume has dropped significantly; do you think it will approach the previous level?

I absolutely think it will rise from today's level. My suspicion about much of it is that RECSI has been a people's stock since Røkke took a stake and it became known that they might open the factory in Moses Lake. Then it was predicted a very big upside in 2020. Then there were incredibly many small investors compared to many other stocks with similar value, and there are also many of those small investors that Pedersen can exploit to make the stock volatile, by setting many hammers and buying and selling in large quantities.

When people trust RECSI as a stock, because I understand that when people get a boost after an upturn, a boost after a downturn, etc. But for each boost, they get really excited and each downturn they get really hurt. So, in a sense, they get a bit broken, and then the stock as well gets temporarily broken. For the boosts that get started, nothing ever comes of it. It never stabilized on the upswing; it always fell after a short time. This can also be seen in the RECSI price, it looks almost like a mountain range. It goes straight up and straight down. The euphoria of going straight up and the sorrow of going down so quickly I think destroys small shareholders trust in the stock. But when formalities are put in place and things get in order, and there is no scepticism/suspicion that it will not go any further, then I think the volume will pick up. The stock becomes interesting both for individuals and for investment-funds. Most likely there will be a higher volume without the hammers that come for no reason.

Have you had experiences with market manipulation in other stocks, what is the difference from the situation in RECSI?

Yes, I have suspected market manipulation in almost all stocks. In all stocks, there are people who want to influence for their own benefit. But this is probably market-manipulation on other fronts than just price manipulation with wash trading. There are other stocks where great future aspirations have been promised by management and the board, later it has shown this was not

the case, then one can suspect that the management sits on even more information than they have shared. But then they try to make the company look more attractive, for example in connection with emissions, here I do not have so many specific companies, but I mean that it happens a bit too often, but it becomes a bit more a matter of opinion where one suspects it with some indications, but not clear enough to establish a case.

I have not taken advantage of similar cases in other companies, and I have not experienced that other companies I have traded in have had similar cases.

How has your confidence in the market been affected by the case?

Not at all, this kind of thing happens all the time. I would rather believe that small shareholders lose more confidence in the market. I'm not a major shareholder on a stock exchange basis, but when I say small shareholder, I mean someone who has some savings invested, and it's not stock trading that puts food on the table.

What kind of effect do you think the Pedersen case will have on the Financial Supervisory Authority and other regulatory bodies in the future?

I'm unsure about that, but I do hope it will be an eye-opener for the TFSAN. I hope they understand that if you have enough money, you can mess around quite a lot with quite a few stocks of a similar size and trading volume. Here, a person who has a large fortune, but not a gigantic one in the financial world, who alone has largely been involved in sending the RECSI up and down. There are many who have become euphoric from the aftermath of Pedersen, and many who have become really scared and “peed their pants” and sold all their shares at a low, as a ripple effect of Pedersen. I think many people have lost money because of Pedersen and have simply lost trust in the stock market. I haven't in any way, but I think there are many others who have.

Do you think this is good for the market?

Well, yes and no. My sense of fairness says it's very good. For my part, it should not be understated that if Pedersen was allowed to continue and he continued to this day, I would have made more money this year than I have. So, for me personally, it's bad because then I can't take advantage of artificial changes, but for the average Joe, who has their savings in a stock, it will be a reassurance that the stock isn't suddenly artificially manipulated.

In your opinion, is RECSI still as attractive to you?

In the long run, it's just as attractive. That comes solely from the fact that the company, not the stock, has performed well. The company has achieved a whole list of things and they have reached their goals according to plan, even though the head of the company died in the middle of planning, negotiations, and everything planned for the future, to restart in Moses Lake where the factory that will lead to the main income for RECSI is located. So, the stock isn't performing very well, but the company is, and I think that will reflect in the stock eventually. So, in the long run, I haven't lost confidence in the stock, but in the short term, it's not nearly as attractive because you can't make nearly as much money with it.

When we had asked these questions, we went onto discussing the graphs showing Pedersen's ten largest wash trades.

January 5, especially, with a sudden spike in volume, followed by a steep change in price, is typical. If you had shown me this graph, without any numbers, and asked me which stock this is on the Oslo Stock Exchange, I would have answered REC Silicon. This pattern is, to my knowledge, unique for RECSI and I have seen this pattern on many occasions.

March 23 could have easily gone under my radar. Here the price doesn't go up or down much. January 5th is very clear and so is May 25th. Here you see that earlier in the day there are two peaks. And you see that there is a downward trend. The third peak comes a bit after one o'clock, and then suddenly he pushes in with a much larger volume and a drop in price, then he confirms a pattern that's already there. And then there's a sharp drop in price in a short time. So, I assume that here large algorithms have picked up that the price is artificially low.

If you study the chart for May 13th, is this also a typical pattern?

It's not a very clear pattern. November 11th looks like there's been a hammer in the closing trade, where the price suddenly dumps a whole percent around the closing trade. This is a typical hammer, where in one trade the price is dumped a lot, often over one percent.

But on May 13th, many have confidence in the stock, the large volumes are green. This means that those who trade buy a lot; they believe in the stock. As it looks to me on May 13th, he has taken advantage of the fact that there is good faith in the stock that day, and he sees for himself that this will be a rising day that he wants to join in on.

A question about your perception. Some of the trades are a bit more ambiguous than the ones we just looked at. We have asked for access to more than 10 trades but haven't got it. In your opinion, having followed the stock closely during the period, would you say that you've seen many of these "hammers"? Is this a typical pattern you see, where there's a huge volume and the price moves sharply and quickly in one direction?

Yes, it's very clear. If you look at January 10th, you see that there are three typical trades that day. One comes when he trades with himself, one a bit after 1 PM, and one at half past 3. And one in the closing auction. These are typical days RECSI is known for, if there's one hammer, it's very likely that there will be another. This especially comes when there's a small or large hammer, and the price can't recover, and then there's likely another one. You see between the first and second hammer, it goes a bit down, but it's quite flat. But you see after hammer number two, there's much more pessimism in the stock. I don't immediately know what the next day looks like, but it wouldn't surprise me if the price soon rises again.

Now, we know that he has made 4,550 trades in RECSI between March 2021 and December 2022. From what you've seen in the market, would you believe that most of these trades are like, for example, January 10th where there's a clear hammer where the price moves significantly, compared to May 13th?

On May 13th, when he trades during a rising market, I think he trades to make money, like everyone else in the market. But what I think Pedersen's strategy is, without being able to prove it, is to hit hard with some real blows that send the stock artificially down, to then buy up again when the price is low. And then sell when the price is going up. I think many of his trades are not wash trades, where he has bought stocks just to sell them normally. But then I think he has used wash trades to create the hammers.

We have some insight into the data, on the days when self-trading has been done, what comes up among changes in shareholders between him and his company has all varieties, both an increase in one and a decrease in the other, increase in both, no change in any of them, and an increase in one of them. We have a very hard time categorizing which days wash trades have been done.

In my opinion, it is natural to believe that Pedersen has a trading agreement with Nordnet, so he doesn't pay for each transaction separately he pays monthly, whether his money is in Dichesbuen or in his own share savings account, makes no difference to him. If I were him in his shoes, I would trade with myself when I want to influence the course, then I would trade with the market when I collect more shares or sell more shares.

The only thing I can say against that is that in the financial supervision authority's report, it states that 'the total transaction costs for these trades is:' and then there's a large field marked with black.

It may be that he trades with brokerage, but that the profit is so large that he doesn't care about it. But I have also been offered by Nordnet to trade without brokerage, then I get to use a special trading version of Nordnet. That's what I would do. I would be surprised if Pedersen doesn't have this agreement, considering how frequently he has traded.

In the report, it is revealed that Iceberg orders are mostly always used, either on both sides or one side of the book. Is this something you noticed while trading?

No, I haven't thought that iceberg orders have been used, even though it makes sense. What I have suspected is that he has set a stop loss order on one side that he has also made so that the whole order must have a bid for the order to be fulfilled, so that he knows exactly the size of the stop loss order that he resolves on the other side.

Have you ever been surprised by spikes of volume showing up from nothing?

No, but I think that it can come from a stop loss. Whether it comes with stop loss or iceberg, it's the same effect. I haven't thought that this looks like iceberg. But I have suddenly seen in the order book, it's been a very ordinary day and then suddenly a storm comes out of nowhere.