Sustainability Analysis of Fast Fashion Brands

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PART I: Background

Motivation and Goals

With flooding in Vancouver and massive hurricanes in the maritimes, Canada is joining the world in experiencing the devastating consequences of climate change and pollution. One unsuspecting culprit of this global phenomenon is clothing. A study conducted by the *Princeton Student Climate Initiative* quantifies that the fashion industry consumes one tenth of all water used industrially in factories and emits more annual carbon emissions than all international flights and maritime shipping combined (*The Impact of Fast Fashion on the Environment*, 2020).

As individuals are experiencing the first-hand effects of climate change, growing environmental concerns are being reflected in consumer behavior. A Deloitte survey found that consumers have become more socially conscious when purchasing clothing and footwear, as they are opting to buy second hand/refurbished clothes and choose brands based on their sustainability and ethical practices (Deloitte, 2022). The *Global Sustainability Study* supports Deloitte's findings, noting that 60% of global consumers rate sustainability as an "important" criterion when making purchases (Businesswire, 2021).

Consequently, fashion brands must look toward addressing this growing momentum for sustainable change in order to maintain business performance in the future. Our goal today is to utilize social media analytics to form key recommendations for fashion brands. Social media is a powerful tool to measure consumer sentiment, thanks to their vaste prevalence and analytical potential (Barnhart, 2019). For the scope of this project, we decided to use Twitter as our main source of data and analysis.

Through our analysis, we aim to understand three key aspects of this issue. First, the report will conduct cross-brand comparison, analyzing to identify any potential relationship between the number of sustainability-related tweets a brand makes with the direction of users' sentiment on their sustainability efforts. Next, the paper will aim to narrow down the root drivers of user sentiment through a time-series analysis involving users' reactions to branded tweets. Finally, we will evaluate the effectiveness of leveraging Tweets as a means of corrective action by measuring

their impact on sentiment. Through this process, we hope to provide insight that would develop into clear recommendations for the sustainable next steps of businesses in the fashion industry.

Data Preparation and Manipulation

There are two key sources of tweets that we scraped for this project: tweets posted by fast fashion companies, and tweets made by users mentioning these companies in a sustainability context.

When selecting the brands to analyze for this report, we incorporated external research with our own knowledge of leaders in the fast fashion industry. There were 4 specific brands that consistently remained notorious for their impact in the environment and which were among the 10 biggest fast-fashion brands: Zara, SHEIN, Uniqlo and H&M. To act as a comparative metric, we decided to include Patagonia, a brand built on sustainable values, to this list.

As for the user tweets, we targeted tweets that included the names of the brands along with certain environmental keywords. The process we followed to create this list of keywords will be explained in detail in the next section. We decided to cap the tweets we scrap at 30,000 in alignment with our technical capacity. Furthermore, we decided to remove the branded tweets using the username from the user tweet dataset to avoid duplication.

In order to ensure that we would have enough data to work with for the time-series analysis, we scrapped four years-worth of tweets, from 2018-2022. Further, using excel, we removed most of the tweets that were created by bots, as that could skew our results.

PART II: Positioning Brands through Cross-Brand Analysis

In this portion of the paper, we will aim to gain a deeper understanding of the current positioning of our selected brands in terms of their Twitter activity and user sentiment. By comparing across brands, we will quantify the extent to which firms are involved in sustainability efforts on their media platforms and highlight the resulting current perception of Twitter users on these efforts. Both processes should lay the groundwork for our exploration of user sentiment and perceptions moving forward.

Methodology

Our insight for this section will mainly be derived from two metrics: the *Sustainability Ratio* of tweets for each firm, and the *Sentiment Score* for users in regards to each firms' sustainability efforts. The *Sustainability Ratio* refers to the total number of tweets related to environmental sustainability that the firm makes as a proportion to the total number of tweets they have made in that same period. By doing so, we would have a broad understanding of the activity and perception of actors from both the firms and the users. In order to achieve this output, there were two kinds of analysis that we ran: Frequency and Sentiment.

Frequency Analysis

In order to filter out the tweets related to sustainability from our data, we needed to create a list of sustainability-related words to find and highlight. To do so, we ran the word_freq script on our branded tweets to locate environmental keywords that were commonly used by the brands. We took inspiration from online environmental glossaries and word banks to select the words to include in this list (*Pollution Prevention and Abatement Handbook*, 1998).

We then launched the find_and_replace program to replace all keywords with a singular term, "sustainable", to make it easier on our end to isolate the sustainability-related tweets from the rest of the database.

Since the find_and_replace script was written to natively work for car models and brands, we had to make alterations to avoid changing the strings contained in a bigger word. For example, the word 'eco' should have been replaced by the word 'sustainable'. However, when we ran the script, we noticed words like 'recommendation' turned into 'r sustainable mmendation'. To avoid this problem, we modified the script to find the target word with spaces around it (Appendix 1). For example, the script now locates " eco " instead of "eco" to avoid the problem.

Sentiment Analysis

Using the sustainability related tweets written by twitter users, a sentiment analysis was conducted to understand how people perceived each brand. This was possible with the use of the Python module Vader which gives a value ranging from -1 to 1. A low score means a negative sentiment in contrast to a high score that shows a positive sentiment. As Patagonia did not have 4 years of data, we decided to compare brands by taking the average of their sentiment score in the last two years: 2021 and 2022 (Table 2.3). This process helps in finding which of the brands are overall more appreciated by people when it comes to sustainability. Later, this study will decompose the overall sentiment scores of each brand to see the evolution of sentiment over time.

Results

Table 2.2: Frequency Analysis

Brand	Total Tweets	Total Tweets Related to Sustainability	Sustainability Ratio
Patagonia	6420	540	8.41%
H&M	1854	87	4.69%
Uniqlo	3880	79	2.03%
Zara	31320	129	0.41%
SHEIN	33811	18	0.053%

Table 2.3: General User Sentiment Surrounding Brand Sustainability

Brand	Sentiment Score
Patagonia	0.53
Uniqlo	0.273

H&M	0.158
Zara	0.081
SHEIN	-0.0062

There are two notable points to be made from the results.

Firstly, there appears to be a positive correlation between the *Sustainability Ratio* of each brand and the *Sentiment Score*, more so than the *Total Tweets Related to Sustainability* made by each brand. This makes sense intuitively, since the more often a firm tweets or posts about their sustainability efforts as a proportion to the rest of their tweets, the higher the likelihood that users would associate the brand with environmental friendliness. If the number of posts made are high, but the ratio is low, then there is a higher chance that the sustainability-related posts could get buried in one's feed.

Unsurprisingly, Patagonia has the highest *Sustainability Ratio* and *Sentiment Score*, while SHEIN scores the lowest in both categories. Contrary to our expectations, however, all other brands currently score positively for user sentiment on their sustainability efforts, albeit some of their scores are quite low. This may indicate that these firms are already making efforts to improve their environmental image, or we may have overestimated users' sustainability expectations for their fashion brands.

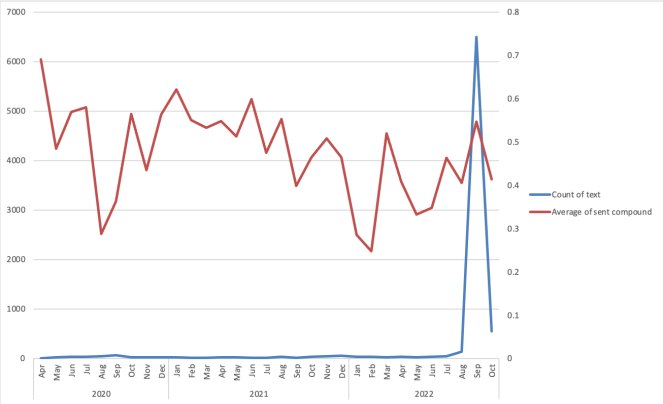
PART III: Understanding the Drivers of User Sentiment on Twitter

A. Company-Related Events (Scandals, Pledges, etc.):

This section of the report examines the drivers of user sentiment about a brand's sustainability practices. We are looking to investigate a brand's sentiment overtime and identify reasons for specific spikes and dips. To identify these specific events, we aim to use external resources such as Bloomberg, Factiva, etc. to find relevant company news about environmental scandals or pledges during a specific time period. We discuss 3 examples to understand this relationship in the following section.

Patagonia

Graph 3.1 : Average Sentiment of Patagonia over time

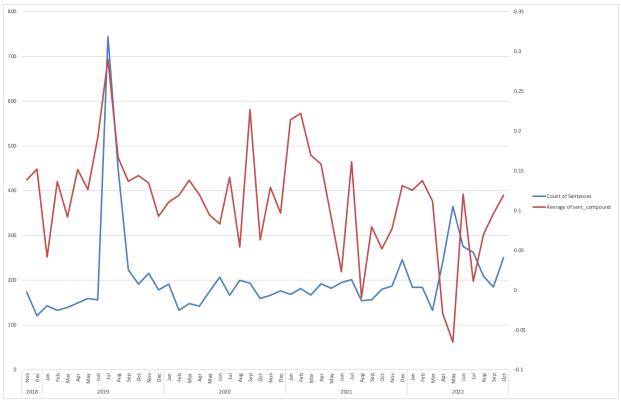


Plotting the twitter users sentiment data overtime, we can observe that the overall sentiment regarding Patagonia has been consistently positive. However, we also plotted the number of user tweets about Patagonia over time and noticed a large spike in the tweets in September 2022. Upon further investigation, we discovered that Patagonia's founder pledged to donate all future profits of the company to fight climate change (McCormick, 2022). Unsurprisingly, the number of tweets about Patagonia grew exponentially to about 7000 for the month of September. We also observe a minor spike in the sentiment for that month, however certainly not as much as one would expect. A probable reason for this phenomenon was that any bold strategic move tends to garner both positive and negative publicity, no matter the real nature of the news. This was verified when we came across tweets having a high-negative score for the month of September. For example:

> *" @RBReich Patagonia just wasted 3 billion dollars going to this stupid " climate agenda" crap. That's like a three year old pissing on a forest fire. Y'all need to give up on this idiotic idea and work on real issues. Like Joe ruining America."*

Zara

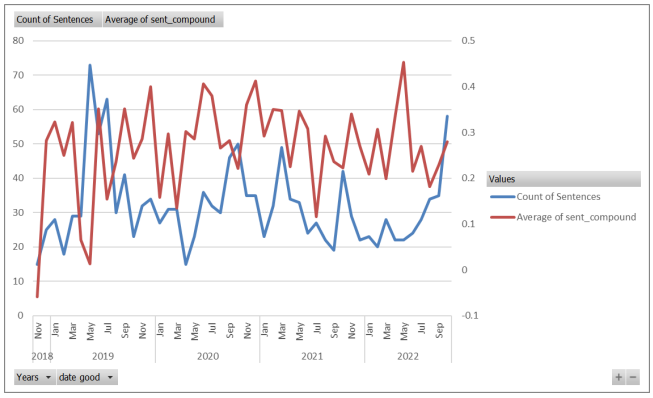
Graph 3.2 : Average Sentiment of Zara over time



When observing the Sentiment and User Tweet Count chart for Zara, right off the bat, one is drawn to the huge spike in the number of tweets and the sentiment score in June 2019. Examining this, we found out that this spike can be attributed to the announcement made by the company that owns Zara, that they plan to have all their clothing made from sustainable fabrics by 2025 (Cooper, 2019). The sentiment score gradually declined and returned to previous levels within the next 4 months as one would expect the 'buzz' to die out. Further variations in the sentiment score for ZARA would be discussed in the upcoming sections.

Uniqlo

Graph 3.3 : Average Sentiment of Uniqlo over time



By analyzing the trends for Uniqlo, one can conclude that the brand has wavering sentiments and tends to gain irregular occasional popularity. The trend that stands out is the sudden increase in

the number of user tweets about the brand and a corresponding immediate dip in the average sentiment scores in early 2019. Further research about the company revealed various negative events occurring during that time, such as a case of racial discrimination in Australia against their HR manager which led to a $1 million lawsuit against the company (Ahillon, 2019). Later that year in August, the lawsuit was withdrawn, which explains the reason for the sentiment to rise back up to previous levels. Although this event wasn't purely related to sustainability, we came across various tweets where people expressed their negative opinions about this brand while also questioning other avenues of the brand (like sustainability).

Overall, we can observe that major company-related events, whether positive or negative, impact the number of people tweeting about the company at a specific time. These events also affect the overall sentiment about the brand's sustainability practices, though this analysis fails to consistently map out the intensity of the sentiment for each event. In other words, popular events tend to have a more varied sentiment regardless of the nature of the event.

B. Environment-related days (Earth Day, UN Sustainability pledges, etc.)

Next, we analyze how external sustainability events impact the average sentiment score of these firms. After exploring the time series plot for the sentiment score, we researched for the highs and lows in sentiment that were not related to company specific news and were occurring on an annual basis.

Earth Day is observed annually on April 22 and is the world's largest movement to demonstrate support for environmental protection. Patterns were found in the data that show big drops in sentiment scores in April as well as an increase in the number of tweets by the users during that time period.

Zara

Looking at Zara's plot for sentiment score, a significant decrease in sentiment can be observed during April 2022. To confirm this finding, we analyzed the tweets that were posted about Zara in April in our dataset. Numerous Tweets validate our hypothesis:

"Happy Earth Day! Here are easy tips to live greener! Shop wisely! Try not to support fast fashion (Zara, H&M, etc)"

"Happy Earth Day. Stop supporting Fast Fashion brands that support unfair wages and child labor, lead to textile waste, massive water pollution, and unsafe chemical use. Forever 21, H&M, SHEIN, or Zara are massive contributors to carbon emissions and water waste".

However, the drop in sentiment values was not as significant for the previous years. A potential reason could be as environmental matters become more and more urgent, Earth Day celebrations gain more popularity. (*Graph 3.2, Appendix 3*)

Patagonia

By contrast, Patagonia's data demonstrated that people had a more positive sentiment about the brand during April in each year (Graph 3.1, Appendix 2):

"Earth day 2022: @patagonia You are a truly amazing company! The main reason I own so much Patagonia and love you so much is your commitment to the environment! If more companies were like you I wouldn't have to worry so much about the kind of earth my grand babies are going to be left with ! BRAVO"

Other movements such as the Climate Action Month in October impact fast-fashion brands' image in a negative manner. A good example here is SHEIN, who experiences drops in sentiment score each year in October, with the biggest decrease in 2022. To reiterate, we ensured that this is not a conjunction with another event, we researched company-related news and looked at the tweets posted. (Appendix 5).

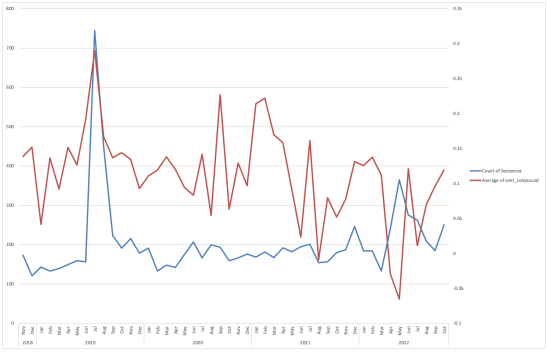
Overall, environment-related events bring stronger spotlight on each brand's sustainability efforts. One can note that these events are increasingly gaining more traction throughout the years.

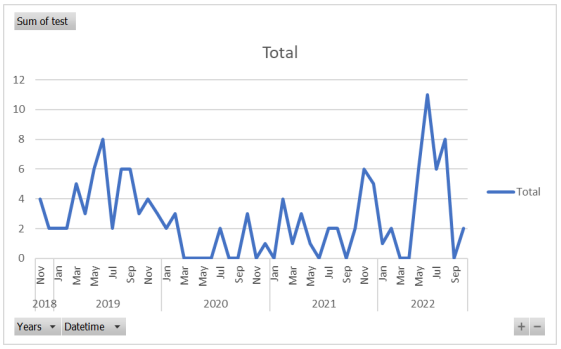
PART IV: Evaluating Tweets as a Form of Corrective Action

For this section of our project, we decided to gauge the effectiveness of Twitter as a corrective action (or medium of speech) to address sustainability concerns about brands. We plan on using tweets by the brand along with the user tweets about the brands' sustainability practices. Plotting this data on graphs will help us identify the relationship between the company's tendency to tweet about sustainability and the resulting sentiment changes among the consumers.

Zara

Graphs 4.1: Average sentiment of Zara and the number of sustainability tweets posted over time

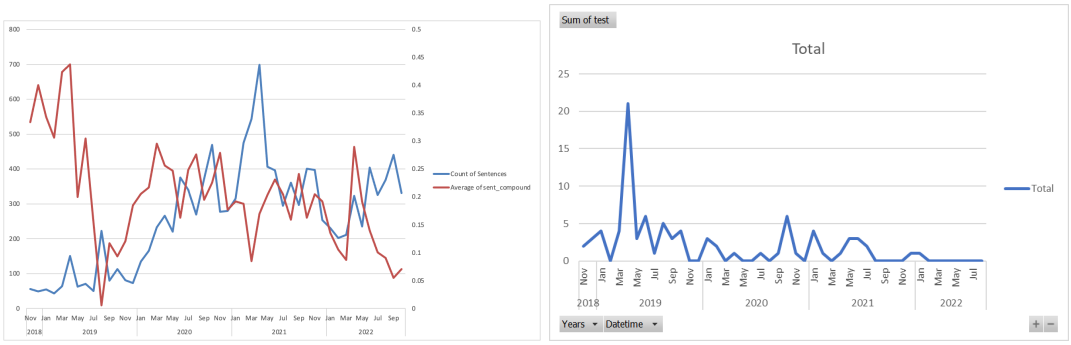




We discussed in the User Analysis section that Zara witnessed a spike in the sustainability related Tweets and sentiment due to a positive announcement. This section explores the other side of the equation and dives deep into how Zara's response deals with declining sentiment and affects corresponding sentiment. For instance, we can observe that the average sentiment score in 2022 was plunging down from February to May, while there wasn't much sustainability-related activity by the brand during that time. However, in April-June 2022 the number of sustainability related tweets by the brand spiked to 10 per month. As a consequence, we can observe the sentiment score crawling back up in June 2022. From the above analysis, there is a likelihood that Zara consumers are positively sensitive to the company's corrective actions on social media.

H&M

Graphs 4.2: Average sentiment of H&M and the number of sustainability tweets posted over time



By contrast, H&M showcases the opposite effect, where sentiment trends appear to drop during the early months of 2019, which is when H&M boosted the number of tweets made about sustainability. This timeline corresponds with H&M's launch of its "conscious collection". However environmental organizations were swift to investigate this strategic move and point out that this was a case of greenwashing (Segran, 2019). These opinions from environmentalists spread rather quickly, thereby garnering significant negative publicity for the brand. Here is an example of one of the tweets from that time period:

> *"Super frustrating to see bloggers and others lapping up H&M greenwashing environment consciousness nonsense. Seriously, does no one do any research beforehand?"*

This is reflected in the average sentiment of the brand's sustainability practice which illustrated a downward trend for the better half of 2019. The key takeaway from this example is that fabricated campaigns about sustainability don't always improve the sentiment and can negatively impact consumer perceptions if words are not backed by actions.

PART V: Limitations and Next Steps

Limitations

The study's main limitations can be divided into two parts: data collection and data processing limitations.

One limitation we encountered when collecting data with keywords is the relevance of the data collected. Although most of our tweets scraped using sustainable terms were pertinent to sustainability practices, some of them were not used properly in their context which resulted in a few outliers. These were also removed manually by screening through the data and deleting non-relevant comments. On the other hand, some people might have talked about sustainability matters without mentioning any of the words included in our list of keywords.

Second, when performing sentiment analysis on comments, we realized that the module Vader also had its own limitations. As Twitter is used to share ones' opinion without much regulation, the platform is often filled with comments containing grammatical errors and unusual terminology. However, Vader does not have the ability to interpret slang, ironical comments, and other subtle nuances in human speech.

Lastly, when comparing different events' influence on the sentiment score under our time series analysis, we came to the conclusion that the quantity of tweets played a role in average sentiment scores. As a matter of fact, we learned that the more tweets we have related to an event classified as positive or negative, the more diversity there is in the opinions about the event. This might incorporate bias in some of our findings as a popular and extremely positive action taken by the brand might not necessarily lead to a higher sentiment score compared to a more casual positive action that has substantially less Tweets.

Final Remarks

The question remains: what should firms do to keep up with sustainability trends? There is decent evidence indicating that tweets can indeed be used as corrective action, even if it's for short-term benefit. However, as H&M has demonstrated, if the tweets are not backed by clear effort or action, then the mitigation efforts could easily backfire. Firms must not take the risk of "greenwashing" lightly.

Additionally, as climate trends grew, the influence of climate/environment-related days, such as Earth day, have also been growing. As users tend to be more vocal and aware of sustainability issues during this period, firms should target their social media activities to match this timeline.

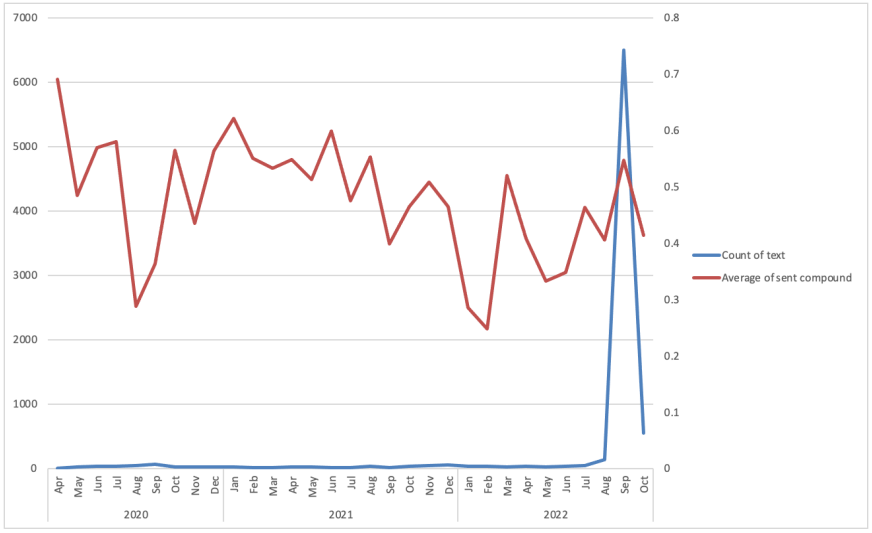
Appendix

Appendix 1: Modified find_and_replace script

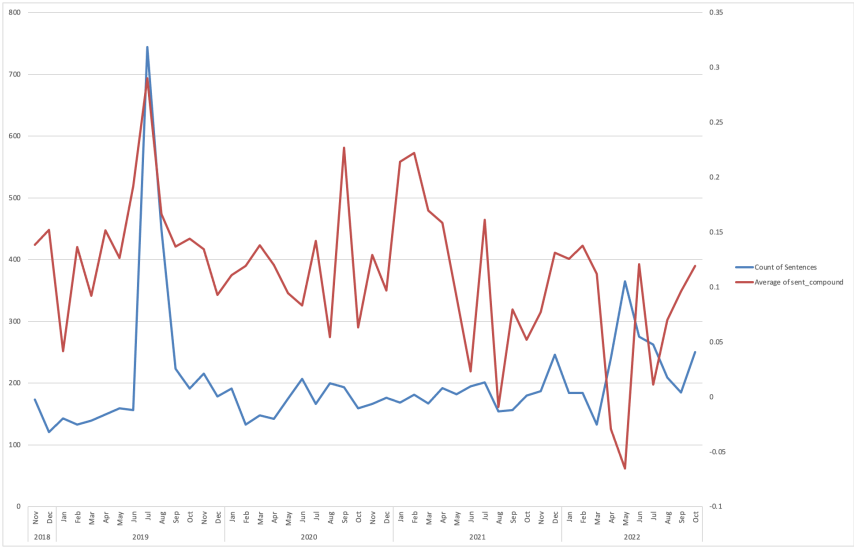
```
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
import csv

# Define the input file name
filename = "C:/Users/teghw/Desktop/Fall 2022/INSY 448 - Text and Social Media Analytics/final project/scraping from companies/zar
# Define the output file name
output = "C:/Users/teghw/Desktop/Fall 2022/INSY 448 - Text and Social Media Analytics/final project/find and replace/by company/z
# The List used to stored the replaced csv files

output_list=[]
with open(filename, 'r') as csvFile:
    reader = csv.reader(csvFile, delimiter=',', quotechar='"')
    for row in reader:
        #This item is the forum post (3rd elements of each row)
        with open("C:/Users/teghw/Desktop/Fall 2022/INSY 448 - Text and Social Media Analytics/final project/find and replace/key
            read = csv.reader(csvfile, delimiter=',')
            for row2 in read:
                #Find and Replace in Bruteforce way
                row[2] = row[2].lower().replace(" " + row2[1].lower() + " ",row2[0].lower())
        output_list.append(row)

# Write the values in output list to the output file
with open(output, 'w', newline='') as output:
    writer = csv.writer(output, quoting=csv.QUOTE_ALL)
    writer.writerows(output_list)
print ("Wrote to x_company_new.csv")
```

```
Wrote to x_company_new.csv
```

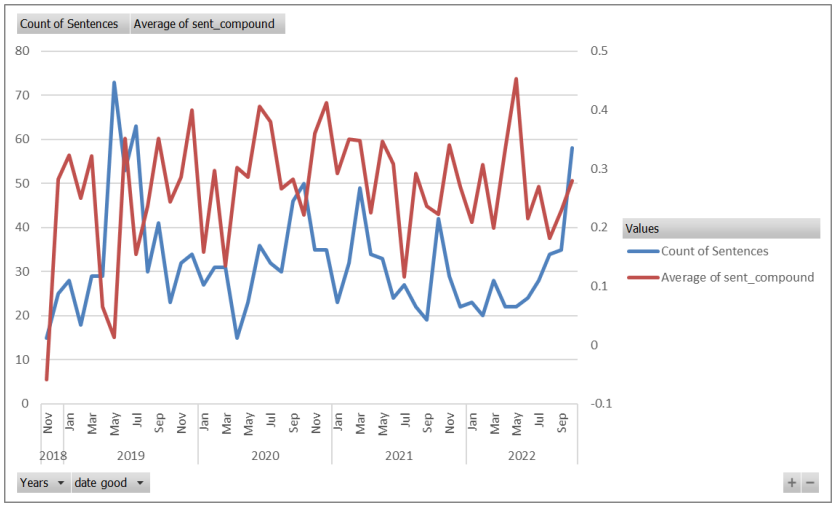
Appendix 2: Average Sentiment of Patagonia over time



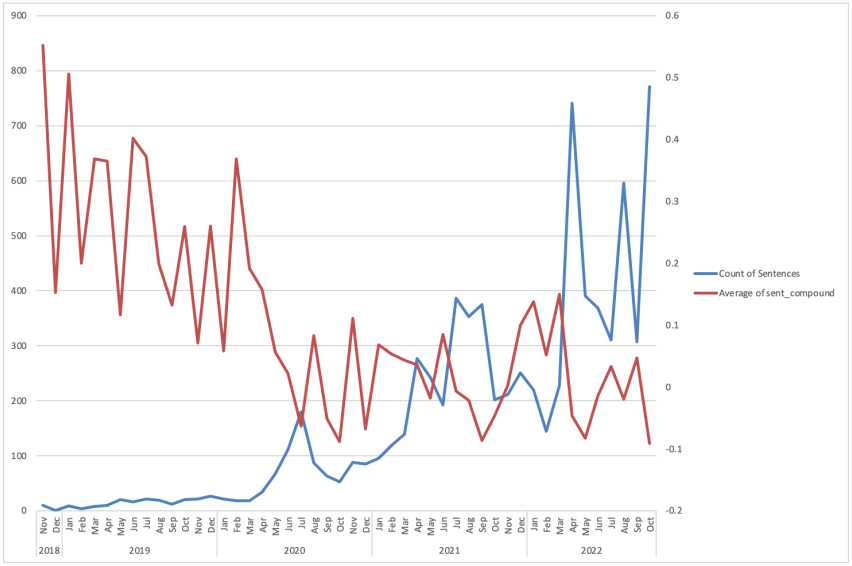
Appendix 3: Average Sentiment of Zara over time



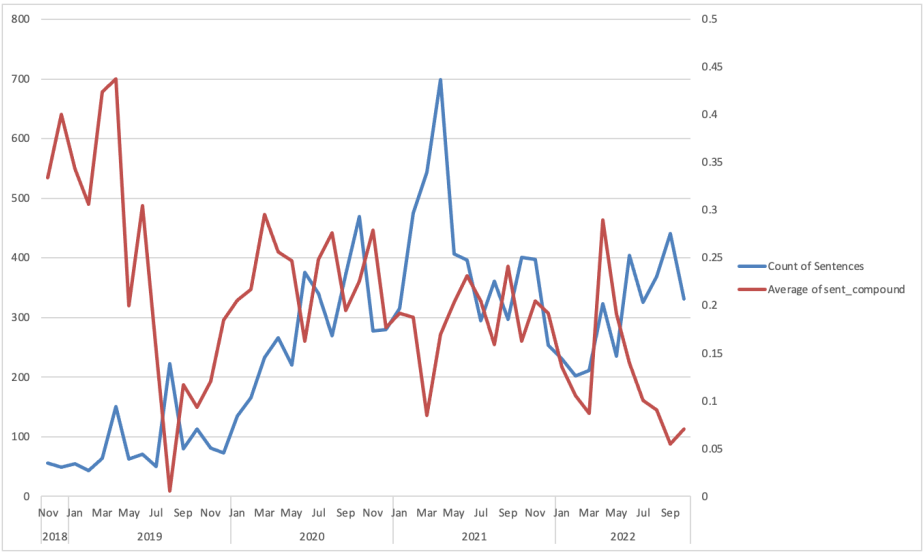
Appendix 4: Average Sentiment of Uniqlo over time



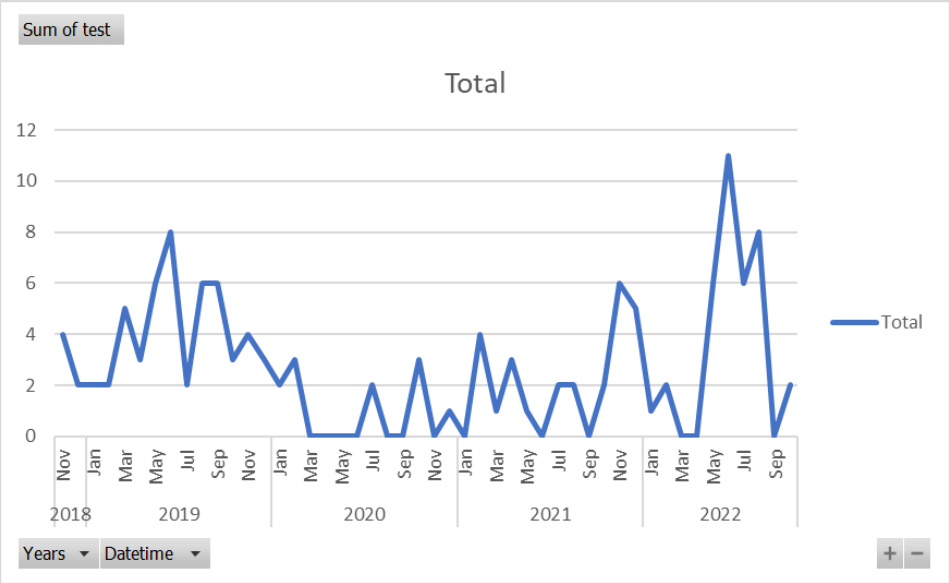
Appendix 5: Average Sentiment of Shein over time



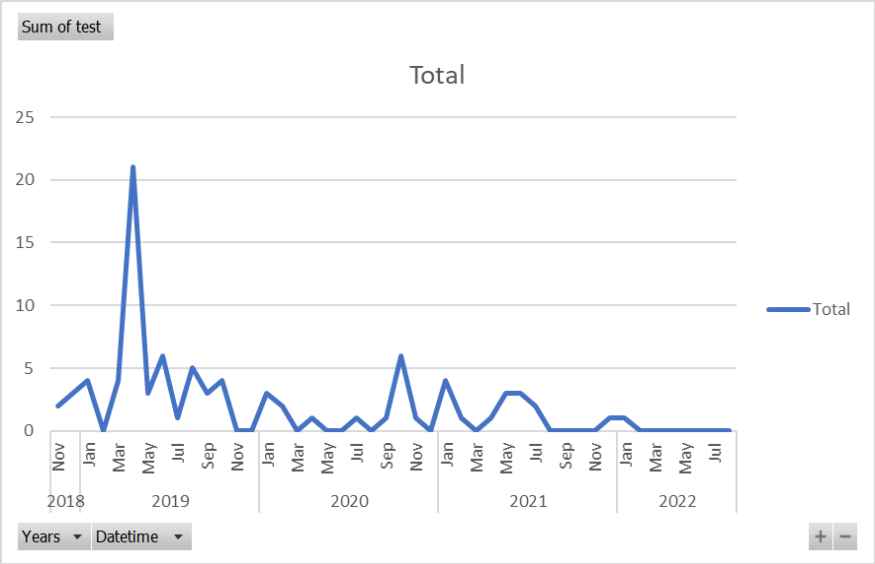
Appendix 6: Average Sentiment of H&M over time



Appendix 7: Frequency of sustainable related tweets over time by Zara



Appendix 8: Frequency of sustainable related tweets over time by H&M



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