



# **Long-Term Effect of COVID-19 Outbreak on Consumer Behavior and Online Retail in the United Kingdom**

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Bachelor Thesis for Obtaining the Degree

Bachelor of Science

International Management

Submitted to Dr. Daniel Dan

Fedor Volchkov

1821059

Vienna, 19th May 2021

## **Affidavit**

I hereby affirm that this Bachelor's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

The thesis was not submitted in the same or in a substantially similar version, not even partially, to another examination board and was not published elsewhere.

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## **Abstract**

The year 2020 has shown to be very different for the world due to the outbreak of COVID-19 virus that has affected the everyday lives of nearly everyone. The change of pace and restrictions have also affected the retail industry in the United Kingdom. It is a current issue at the time of writing, making the topic highly relevant for the future

This study has used Time Series analysis to determine whether the shifts in retail industry towards online purchases can be attributed directly to the virus outbreak as well as investigate the reliability of historical data-based forecast methods in the time of uncertainty such as the ongoing pandemic. The study discusses the state and role of retail in the United Kingdom prior and during the COVID-19 outbreak as well as the holistic dynamic of online retail practices worldwide.

By using data smoothing against seasonality it was made possible to relate retail sales data with the infection rate data, facilitating their correspondence and the effect of one on the other. By comparing the created forecast for the year 2020 to the real-life data It was concluded that sole reliance on historical-data forecasts can work well in predictable market conditions, however greatly deviates from the uncertainty created by said outbreak. All things considered, the study successfully created a future outlook for the upcoming trends in retail methodology and with that in mind advocates for the shift towards a more internet-based commercial activity.

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## **List of Abbreviations**

UK – United Kingdom

ONS – Office for National Statistics

COVID-19 – Coronary Viral Disease 19

B2C – Business to Consumer

B2B – Business to Business

# **1 Introduction**

## **1.1 Background**

On 31st of December 2019 a cluster of pneumonia cases was reported in Wuhan, Hubei Province of China that after on has been identified as a novel virus named COVID-19, on January 12th 2020 China has publicly shared the genetic sequence of said virus. Later that month on the 22nd evidence of human-to-human transmission arose, and on the 30th it was given a high risk label at the global level (WHO, 2020).

At the time of writing (14th of April 2021) there are 136,739,552 confirmed COVID-19 cases along with 2,947,244 deaths (WHO, “WHO Coronavirus (COVID-19) Dashboard”).

The statistic shows that the virus could impose serious danger and thus many of the countries affected imposed lockdown measures, that will be covered in greater detail in the Literature Review section of the paper. The lockdown measures worldwide primarily involved restrictions on movement outside of one’s home and restrictions on keeping brick-and-mortar retail outlets open, forcing the businesses to change or minimize their activity.

## **1.2 Relevance of Topic**

The fact of said lockdown however implies a shift in the everyday life of an average human in the given population, which inevitably includes the process of consumption of goods and services, many of which have become unavailable as a direct result of the outbreak. That ultimately brings it to the relevance of research directed at the ways how can a consumer still remain consuming in the new reality that the pandemic has brought, the willingness of the consumer to carry on consuming and what selection of goods and service will be relevant for that consumer in the new norm of living, now that the outbreak has been affecting people’s lives for slightly over 12 months time.



The COVID-19 is an ongoing global event, with a fairly recent point of start and a quite unpredictable nature due to absence of past experiences of such scale and coverage in human history. It is therefore crucial to study the intricacies of its potential influence on other dynamics of everyday life, firstly to be able to adapt to the new possibly long-lasting changes that the spread of illness has imposed on the public. Given the topic's origin date, the recency factor is strong in this study, as it may be one of the first research projects to address the issue of online retail shift in the United Kingdom and what could be derived from it for the future. In the next section I'd like to express the exact aims of research further.

### **1.3 Aim of Study**

The study is aimed at determining the effect the presence of COVID-19 and corresponding restrictions imposed on the public, have on the purchasing behavior the customers in the domestic market of United Kingdom showcase, the buying tendencies that experience shifts induced by lack of mobility, the product demand change due to the newly readjusted priorities if such are present. Ultimately these variables are expected to converge in the study to determine how they affect online retail sales, what attributes to it and what could this mean for retail businesses long-term in the future.

After the effect is measured the study is aimed at creating a forecast of the future values of retail merchandise and services sold online, understanding the market trends of the United Kingdom and providing help of understanding which direction the retail business and its customers are likely to be diverging to post-COVID.

The research is also aimed at evaluating the accuracy of the forecast that is based on historic data, the goal is to determine whether reliance on such forecasting method is still possible in less predictable macroeconomic conditions without significant deviations from the real-life data.

The study is also meant to encompass the current available information on COVID-19 and showcase whether the techniques and logical approaches that are taken at this time for tackling the said topic will prove themselves to hold true in the medium and long-run future.

#### **1.4 Research outline**

After the 'big picture' aim of this research has been defined it is important to narrow down the objectives of the study further in order to outline what precisely needs to be determined by this research as well as what needs to be empirically measured to obtain the desired results.

To begin, the research question of the paper needs to be voiced out, so do the variables that go into the technical part of the data analysis necessary to progress the work. To keep the main framework simple and easy to understand the aspects are phrases as following:

- Research Question - "Does the COVID-19 outbreak have an effect on the online retail sales in the UK?"
- Independent Variable of the study - "COVID-19 infection rate", this is taken as the independent variable due to the reasons of it being nearly impossible to influence by anything coming from humans, but more importantly, because the effect of this variable needs to be measured to get results, making it the "ground zero" of this research.
- Dependent Variable of the study - "Online retail sales in UK", the dependency of this variable is explained by the need to evaluate the effect the earlier mentioned variable has on this variable, therefore suggesting sales fluctuations' volatile and dependent nature.

With this in mind, the research concentrates on empirically determining the numerical value changes between these two main variables, as that could serve as the ultimate indicator of the effect presence. However, other things need to be taken into account

In order to be able to understand and predict the long-term effects of the pandemic, and evaluate the purchasing behavior of an average retail customer in the United Kingdom. These extra variables that go into the long-term prognosis of retail domestic market are covered in the next section.

## **2 Literature Review**

To be able to fully interpret the materials of this study, it is vital to define some of the concepts used in it. Without proper definitions it could be challenging to research and filter out the information relevant to the research topic. The concept of “COVID-19” has only been created recently and gained traction partially due to the topics covered in this study, showing it’s novelty and relevancy to the current world events and the study. It is also crucial to gain in-depth knowledge on the background information of the location of case study and it’s recent history with the COVID-19 virus to be able to use the information in own research and create further forecasts.

### **2.1 Definitions**

#### **2.1.1 COVID-19**

The COVID-19 is a newly named mild to severe respiratory illness with typical symptoms including cough, fever and loss of smell that could also progress to pneumonia and respiratory failure. The virus was first discovered in Wuhan, China in 2019 from where it has later on spread out into other countries eventually causing the pandemic (Merriam-Webster, “Covid-19”). The virus is believed to spread mostly through close contact and is generally considered highly contagious thus the lockdown measures were chosen as the prevention method, limiting gatherings and therefore respiratory droplets exchange (“Coronavirus (COVID-19) frequently asked questions”, 2021). The term itself is derived from “CO” for “Corona”, “VI” for “Virus” and “D” for “disease” with 2019 being the year of discovery (“Coronavirus (COVID-19) frequently asked questions”, 2021)

### **2.1.2 Retail**

The Merriam-Webster dictionary defines retail as “to sell in small quantities directly to the ultimate consumer” (Merriam-Webster, “Retail”), in this case meaning almost any B2C (Business-to-Consumer) industry such as Clothing, Food, Electronics and many more with the exception of Automotive Fuel. Though fuel is a consumer good and is sold to the final consumer by businesses, it is exempt from the statistic as to even out the numbers of traditional vs online retail in volume, value and market share comparisons, this is further covered in the Methodology section of the paper with relation to the sample and types of data used in analysis.

### **2.1.3 Case Study**

A case study allows to examine a concept or an issue in-depth in a real-life scenario with little to no variable manipulation (Crowe, et al., 2011). This approach fits well with the aim of this study as it allows to analyze information that was obtained naturally and therefore is high in validity. As what this paper is aimed at measuring and correlating the relationship of two real-life occurrences or events that is COVID-19 outbreak and raw data showing changes in the way how people shop, rather than some abstract concepts, a case study is fitting as real life results allow real life interpretations and real life progress with the current shifting situation, more on this will be touched upon further in the Methodology section where the Research Design is described in greater detail.

### **2.1.4 United Kingdom**

United Kingdom or United Kingdom of Great Britain and Northern Ireland is a country in Europe comprised of England, Scotland, Wales and Northern Ireland with a population of roughly 65 million people (Merriam-Webster, “United Kingdom”). The UK ranks high in the Human Development Index positioning itself on the 13th overall place with the HDI value of 0.932, life expectancy above 80 years and over 46,000 USD Gross National Income (GNI) per capita (“Human Development Reports”, 2020), therefore it is often included in the lists of More Developed Countries and is generally

considered part of the developed world. Another aspect of why the United Kingdom was chosen as the location of case study research is because prior to the pandemic it was ranked 2nd in countries most prepared for a pandemic list (Cameroon, Nuzzo, & Bell, 2019), regardless of whether or not that statistic has proved itself accurate, the United Kingdom is a country that other countries are likely to look up to for expertise and well executed decisions due to its status in global politics, it was therefore decided that it is best to showcase the better case scenario as an example for other countries to later expand on and follow rather than take an average scenario that will be challenging to use for paving future paths for commerce and purchase behavior analytics and forecasts.

## **2.2 COVID-19**

On January 29th 2020 the first two COVID-19 patients tested positive in the UK (Aspinall, 2019) and later on January 30th 2020 the first COVID-19 death in the UK has been registered (McMullan, Duncan, Blight, Gutierrez, & Hurley-Jones, 2021). This broke ground for the still ongoing at the time of writing pandemic-induced crisis that will result in over 2.65 million deaths worldwide and over 125,000 deaths in the UK alone (WHO, "WHO Coronavirus (COVID-19) Dashboard"), as well as a significant decrease and shift in commercial activity, which I will touch on later in the chapter.

As the official information shows, retrospectively the outbreak in the UK followed a pattern similar to the pandemic worldwide, with two waves in spring and fall of 2020 going into the winter of 2021 ("Official UK Coronavirus Dashboard", 2020), though the first wave is seemingly much smaller and therefore less significant than the second one, it still has had its influence on the commercial practices in the United Kingdom and led to the involuntary restructuring of fundamental processes and methods of conducting business.

On March 23rd 2020 the United Kingdom government announces the first lockdown measures, limiting people's options to go outside and granting police authority to enforce the newly introduced rules (McMullan, Duncan, Blight, Gutierrez, & Hurley-

Jones, 2021). As it was believed that the lockdown is essential to save lives of people as concerns about the strength of the National Health Service (NHS) were expressed (Iacobucci, 2020). The imposed limitations implied new rules for the businesses as well as other places opened to the public, Prime Minister Boris Johnson covered the closure of all non-essential stores in his open letter to the public, urging people to be responsible and avoid gatherings of more than 2 people (Johnson, 2020).

The lockdown lasted until so called 'Super Saturday' on July 4th 2020 when retail businesses and foot outlets such as pubs and restaurant were allowed to open (Hill, Campbell, & Walker, 2020), however despite the stagnation of daily infection rate increase and government's efforts to tackle the disease and avoid the second lockdown measures, businesses only had roughly 4 months to reopen and operate until the second lockdown was commenced on November 1st 2020 urging the non-essential market segment to close down for an initial period of 4 weeks (Savage, Inman, & McKie, 2020).

Mid-December of 2020 a new variant of COVID-19 has been found in the south of England (Sample, 2020), believed to be 30% more lethal than the previous strain (McMullan, Duncan, Blight, Gutierrez, & Hurley-Jones, 2021), delaying the opportunity to reopen by an indefinite time period, forcing businesses to adapt even further to the new reality of conducting commercial operations and functioning under rapidly changing conditions.

### **2.3 Online Retail**

Online retail can be defined as the process of selling a product or a service online, through a sales distribution channel such as website replacing a physical store, and distribution/fulfillment centers serving for storage and shipment of product for the final consumer, same as traditional retail, online retail refers primarily to B2C business model (Hargrave & Anderson, 2021). Online retail has been gaining traction in recent years as suggested by the E-commerce worldwide report, the values recorded since

2014 have shown stable growth in volume of purchases made online over the years and the projections only estimate further growth into the mid-20s (Fig.1 & 2)

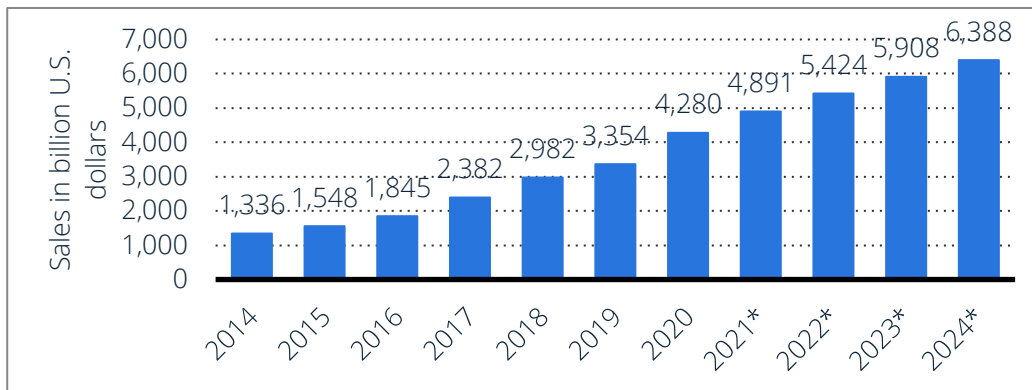


Figure 1. Online retail sales in billions of US dollars. Source: Statista

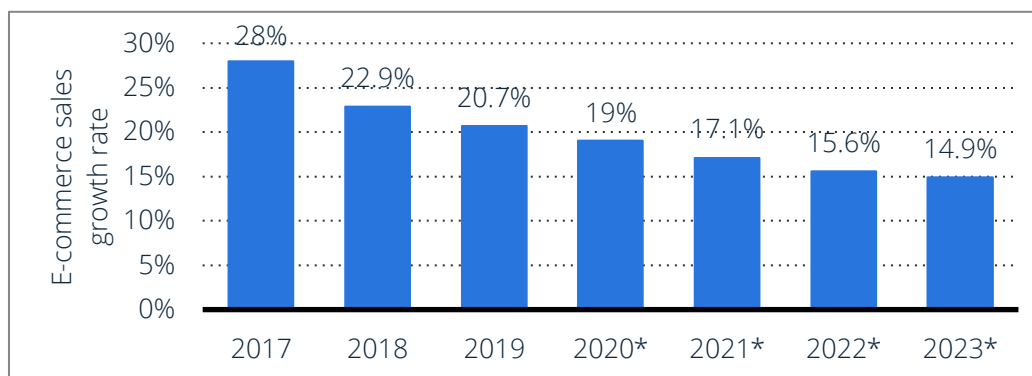


Figure 2. E-commerce sales growth rate expressed in %. Source: Statista

The numbers of buyers worldwide have also shown growth (see Fig.3), which can only suggest that customers are becoming more and more aware of the possibility of shopping online, thus a snowball effect could be expected, as it is often that a launch of a new product or service can have a difficult start but as more people decide to try it and have a pleasant experience, each additional customer is easier to gain, the service in this case being the global possibility to order a product online and expect it to be delivered to you whether it is physical or digital.

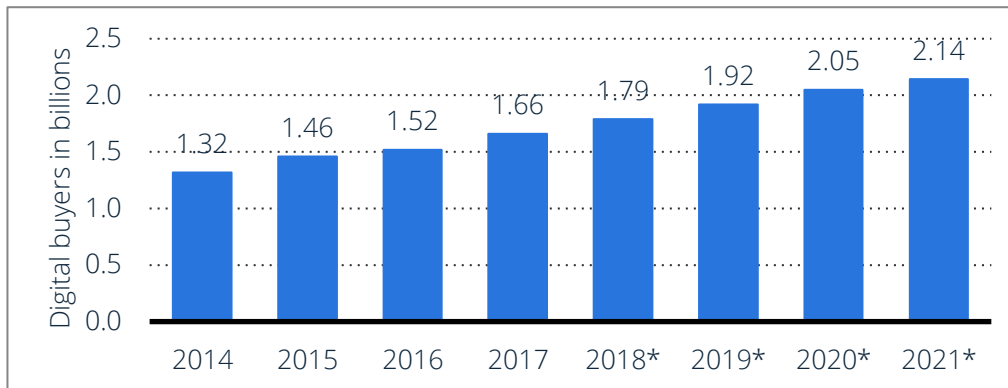


Figure 3. Number of digital buyers in billions. Source: Statista

For online retail to become the new norm, not only the purchasing process needs to be convenient, reliable and easy to orient in - the people need to fundamentally shift their thinking in terms of where they seek new products to purchase and what channels of information work best for them to be inspired and convince to make the purchase. As the report further suggests the top 6 channels for an online customer to become familiar with the product are also online, with physical store landing on the 7th most popular position (see Fig. 4), this suggests that Online Retail is largely an online-only ecosystem where marketing and education of customer about new possible ways to buy are best to be done also online. Thus the more this field is explored, the more likely online retail is to prevail, with currently 'offline customer' eventually switching to the new ways of consumption.

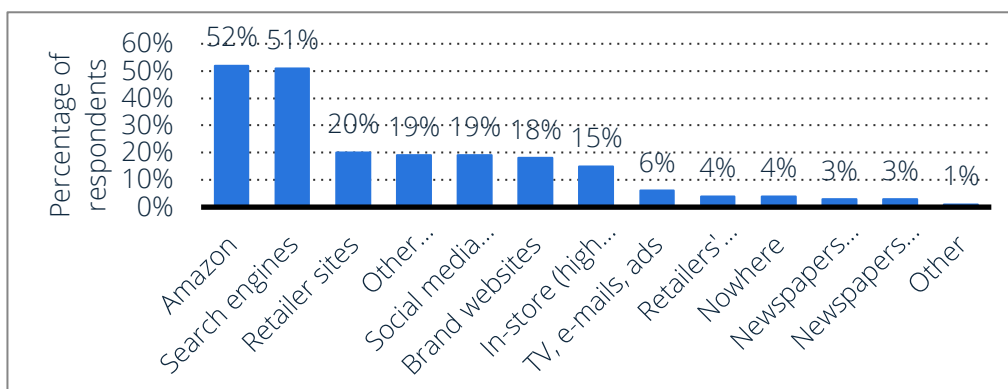


Figure 4. Source of product inspiration for buyers. Source: Statista

The projected popularity of online retail in Western Europe is on the third place by region worldwide at roughly half a trillion US dollars, which includes the United



Kingdom in the geographical category, though the placement is not leading worldwide it could mean more room for expansion in the region in the future, and that is why it is vital to look at the United Kingdom separately to be able to form further predictions.

The report on the internet industry in the United Kingdom suggests that the country's domestic market follows a similar trend as does the worldwide dynamic of implementation of online sales into the retail industry. As recorded and shown on the graph below, the B2C market segment is showing stable growth in volume expressed in British Pounds from year to year, despite a dip in 2015, the dynamic is still evident (see Fig. 5). The trend can also be seen in the graph showing the shares of revenue that can be attributed to digital channels with a five year difference in measurements as well as the statistic showing the comparison between digital and physical sales (see Fig.6).

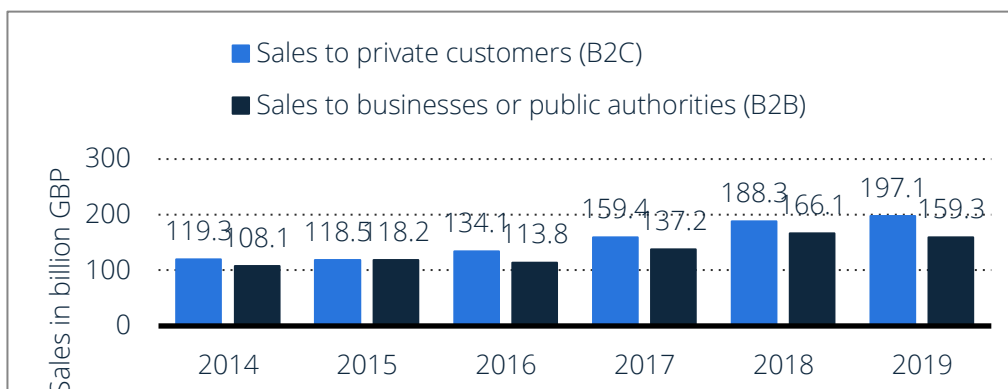


Figure 5. Value of sales in online retail in the UK in billions of British Pounds. Source: Statista

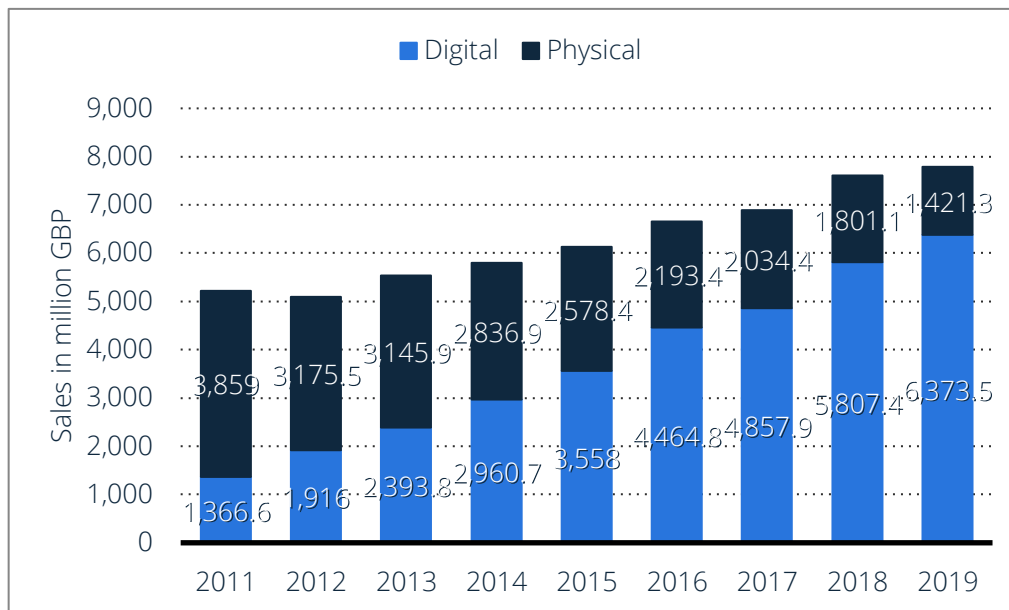


Figure 6. Share of digital vs physical sales of entertainment industry in the UK. Source: Statista

Based on the market dynamics discussed, the general trend can be labeled as bullish and therefore a steady expansion of the online industry can be expected under normal conditions. However, could already at the stage of Literature Review this be somehow tied to the COVID-19 pandemic, with it impacting the industry to the point that it deviates from the already existent projections? Going back to the Worldwide Report, it could be suggested that certain discrepancies and less expected observations were found when discussing the topic on the global scale. For instance the worldwide interest for search engine keywords “buy online” has nearly doubled within the month of March when COVID-19 reached multiple Western countries including the UK (see Fig. 7).

A different e-commerce report for 2020 suggests that all online commercial activity can be expected to grow 10% on average as a direct result of the pandemic with the biggest winner of the situation being Food & Personal care at 21% projected growth and the smallest growth of 7% is expected from the Electronics & Media sector (Statista, 2020). With this in mind it is already fairly clear which direction the shift can be expected in the United Kingdom as well, however it is necessary to look at the domestic market and retail trends there in greater detail to be able to state more on the matter.

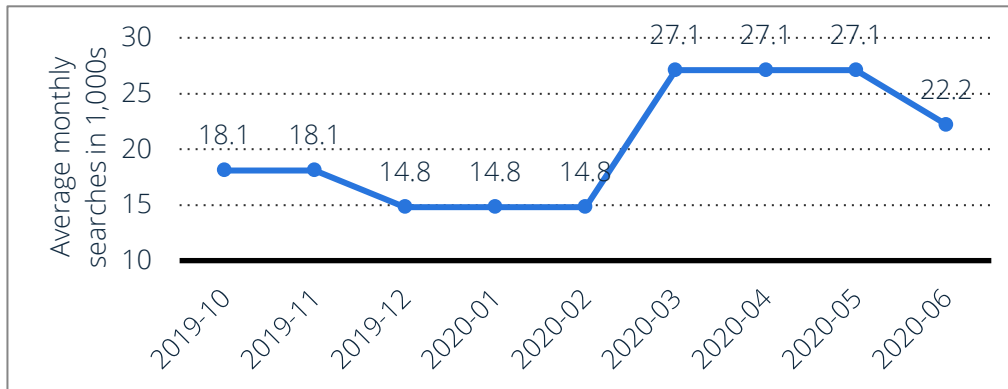


Figure 7. Average monthly searches of key words “buy online” per 1,000. Source: Statista.

## 2.4 Retail Before COVID

Based on historic data provided by the Office of National Statistics of the United Kingdom, all retailing in the UK has been following a fairly predictable upwards pattern with seasonal peaks and troughs based on the time of year (see Fig. 8), as for example annually the highest value of retail sales was in December around Christmas time with three notable peaks between the said season (Dalglish, 2021).

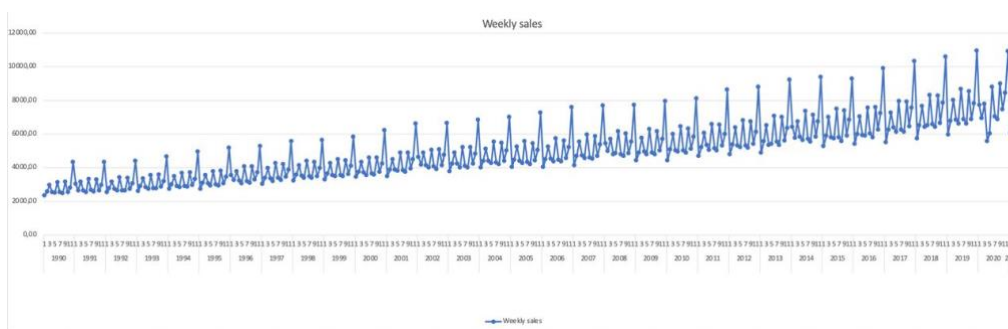


Figure 8. Average weekly sales of retail in the UK. Source: ONS

As this data also suggests, if values of traditional retail are separated from the values of retail done online, it is likely that the increase over the years can be largely attributed to the latter, as the traditional retail timeline appears flat with a slight dip present in the year 2020 (see Fig. 10), whereas online retail is going up in value and market share (See Fig. 9)

(Dalglish, 2021). Important to note, in this context the dip does not represent the nominal change in values, as it illustrates the general trend of each segment.

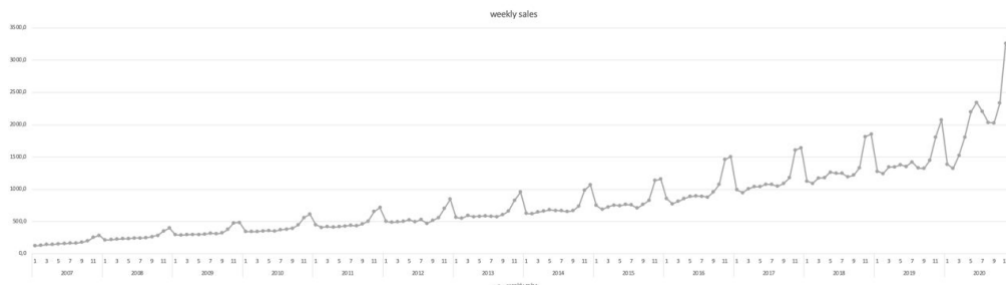


Figure 9. Average weekly online retail sales in the UK. Source: ONS

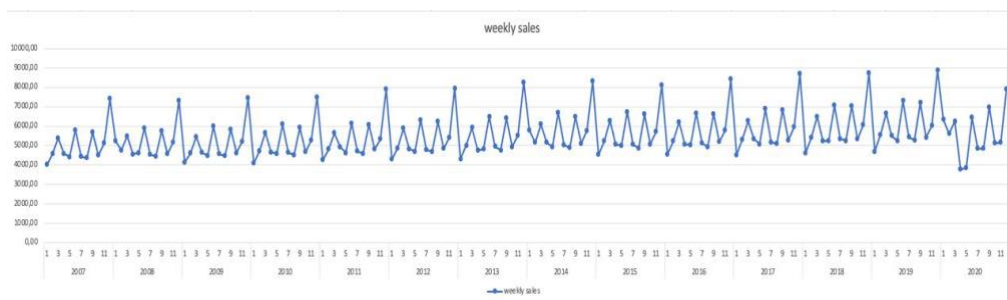


Figure 10. Average weekly offline retail sales in the UK. Source: ONS

With the research topic in mind, it isn't crucial to understand the dynamics of traditional retail thoroughly, as it is the most established form of retail by value and market share (Dalglish, 2021) and therefore shown to not be significantly volatile even with such major events such as pandemic-induced lockdown.

Online retail however, has been gaining traction in the recent years prior to the COVID-19 outbreak, showing growth numbers such as 15.9% in 2017, comparatively to only 2.3% for the traditional retail stores. Online spending has been also growing, hitting 18.2% of all money spent on retail goods being spent online in 2018. In 2008 the proportion of online sales to traditional brick-and-mortar sales was 4.9%, so it can be perceived as a significant leap in just a decade time, increasing more than threefold (Humphries, 2019).

However, certain industries had it easier growing online presence, with clothing and department stores selling nearly 20% of their merchandise online, food sector has been floating at 5% of sales done online (Murphy, 2018). The pandemic could be viewed as an opportunity to help the lagging market segments catch up with the rest thus driving the overall online sales upwards in value, as well as already present industries being largely non-essential (such as clothing) and so being forced into restructuring.

The online market segment entered lockdown on a 4 month decline of share of total retail sales, falling from 21.6% in November 2019 to 19.1% in February 2020 (Dalglish, 2021), a normal occurrence due to seasonality judging by the historical data, the market however was disrupted by an atypical event not seen previously in modern history so the market reaction was unpredictable. With that said, looking at the performance of retail businesses under new rules could give enough insight to be able to predict next market trends, improve efficiency of current business models and develop new models from scratch that would be tailored to the new reality that this global outbreak has brought, bringing us to the overview of the retail segment once the outbreak has started.

## **2.5 Retail During COVID**

As previously mentioned, COVID-19 outbreak resulted in lockdown and closure of all non-essential businesses due to health concerns and in order to contain the spread of disease (McMullan, Duncan, Blight, Gutierrez, & Hurley-Jones, 2021), it is safe to say that changes in how retail markets function were inevitable as not only the traditional forms of retail became extremely limited by default, but also it is unclear when the pandemic will be tackled and whether it'll be possible or even necessary to revert back to the pre-COVID system once restrictions can be lifted.

In hindsight, it can be seen that the overall Sales in retail sector has experienced a major downfall of 0.3% in comparison to 2019 numbers, making it the biggest fall since

1995 (Partington, 2021). This statistic could be attributed to the imposed limits as well as growing unemployment rate of 5.1% making it the highest figure in 5 years, implying lesser purchasing ability and available disposable income to the general public (King, 2021).

It's no secret that if one channel of commerce is limited or shut off, the activity in others is likely to increase as people still need to purchase goods, perhaps a different selection and in smaller quantities, yet it is hard to imagine that a society stops consuming non-essential goods altogether even amidst pandemic and unclear socioeconomic situation. So that is exactly what happened with online segment of retail goods, as it was observed that online sales have shown 36% annual growth making it the highest performance since 2007, with the predicted growth being only 7.8% prior to the pandemic (Partington, 2021). The growth numbers bring the overall share of goods sold online up significantly, as according to the UK's Office for National Statistics market share grew from 19.1% in February 2020 all the way to 32.8% in May 2020 (Dalglish, 2021), an increase never seen before in the recorded statistics that suggests possible correlation of COVID-19 events to the unexpected growth of online retail. This brings up a question - what did people buy and for how long those newly acquired consumer traits will define the market and shape future businesses? Will this shift be temporary or is this the brink of the completely new age of consumer behavior and spendings?

A survey suggests that people have actively increased their online consumption of not only goods but also services with online banking and streaming services, 22% and 34% respectively have reported using said services more with share of people with access to any subscription growing from 55% to 65% in one year, however only online banking is likely to continue rapid development as 62% of respondents claim that they plan on using this service on similar basis post lockdown, in comparison to 45% in streaming services' case making it the minority (Jahshan, 2021).

Not every industry has experienced drastic changes in the way how their retail outlets function, even when discussing solely non-grocery and non-essential goods. Based on

Google's search insights for Consumer Electronics segment the proportions of offline and online sales did shift from 55/45 in 2019 to 73/27 in 2020 (expressed in percents with maximum value 100), fundamentally the change is not that significant as the hierarchy has remained the same with offline brick-and-mortar outlets still being the main channel of sales for the said industry and companies within it, however when drawing a comparison to the Fashion industry for instance, the same insights show that the proportions changed from 41/59 in 2019, showing primary reliance on offline purchases whereas in 2020 the ratio was already 86/14 showcasing complete flip of how fashion oriented companies make sales and push their products. This could be attributed to a different survey that suggests that people no longer wish to 'shop', they wish to 'buy' meaning that purchases made in 2020 were likely to be more direct and to the point with less time being spent on browsing different options. The same survey suggests that new product discovery is likely to be primarily digital implying the inevitable shift to an all-digital consumer environment where company stores play a small role and could be used as marketing displays and shopping outlets for the shrinking minority of people who prefer in-store shopping.

As mentioned, to go forward it is not only crucial to understand the sales channels that people will grow to prefer using over the lockdown time period to be able to run a retail business successfully in the upcoming years, but also to be able to estimate what products are in high demand at the time, as demand is key to a well-selling product. Going back to information collected by Google through analyzing the information searched by people in the United Kingdom, it can be observed that such topics as Home Decor and Gardening shown interest growth of up to 250% when comparing to the previous year, the trend is believed to stay on the rise and potentially find a new equilibrium as more and more people shift their priorities towards increased spendings on their homes as they start spending more time in them, similar logic can be applied to gardening as it is a leisure activity that one can do without leaving their home which is quite relevant for the year of 2020 (L'Estrange, 2020). With the pandemic border restrictions affecting global supply chains it is also evident that the general consumer in the UK is now more aware of importance for the domestic economy to be able to supply it's people with goods they need and it shows,

the majority (57%) report that they are more likely to still spend locally on local products rather than elsewhere as well as Google search has seen a significant increase in ethically conscious brands that responded to the pandemic as well as minimize their waste and footprint (L'Estrange, 2020). Notably, it is also suggested that higher engagement online is why sales were able to return to their pre-pandemic numbers.

## **2.6 Forecasting**

When discussing forecasting in the context of this study, it primarily focuses on sales forecasting - prediction of future sales revenue that can be based on historical information as well as general industry trends (Bishop, 2020), in this context it'll be assessing the retail industry, the industry selling consumer goods, and concentrate largely on historical data to determine the said trends. There are several reasons why forecasting sales can be crucial for understanding an individual business or, on the macro level, a country's economy. Most importantly it can be used to make accurate decisions regarding stock keeping, staffing and maintaining understanding of customer demand as well as adjust your practices to maximize the efficiency of a business functioning (Walker, 2021). Creating a sales forecast can help predict cycles and seasons of sales, that can assist in making all the above mentioned decisions (Bishop, 2020), under usual, predictable conditions. However, the outbreak of COVID-19 created unpredictable market conditions that make forecasting more complicated due to lack of historical data recorded during a similar event, as no such event has occurred before in modern history.

This therefore raises a question, can forecasts be used and trusted during uncertain times and if not, how far does a forecast based on pre-recorded data would deviate from the actual events and values recorded in the year 2020? During a time of uncertainty it is necessary to evaluate the priorities within the company (McLeod & Lotardo, 2020), therefore the breakdown of offline and online retail could assist further in determine whether a priority shift in sales channels is necessary to continue working efficiently during and after the pandemic. The retrieved information could



also showcase the accuracy of previous existing forecasts when it comes to estimated growth rate of online retail as well as general projections based on historic information available through The Office of National Statistics of the United Kingdom.

After reviewing the retail industry in the United Kingdom pre- and post-COVID outbreak, it is time to review various forecasting techniques to be able to distinguish the one most fitting for proceeding with the case study and research what outcome could be expected from the pandemic conditions and retail restrictions.

Three types of forecast can be identified according to Harvard Business Review - Qualitative Techniques, Time Series Analysis and Projection, and Causal Models (Chambers, Mullick, & Smith, 1971). Each of the types works best in a specific scenario and for a specific data type available therefore it is now necessary to see what can be attributed best to the earlier described context of the study.

Qualitative techniques imply usage of qualitative data, meaning likely non-numerical and possibly subjective such as expert opinions as suggested by HBR. There are several methods covered in this review alone, however it can already be determined that these techniques are unlikely to fit the desired research based on the data required. The data available for this research is numerical and will be covered in more detail in the following chapter.

Time Series Analysis and Projection focuses on pattern recognition and change and is entirely backed by historical data (Chambers, Mullick, & Smith, 1971). Out of the methods covered, 'Moving Average' has caught attention for being able to identify seasonality in the data and assist in its removal. This could be of help for further isolating the historical data that can later on be used to forecast future sales as well as allowing to witness the general trend of value shifts.

The third type is Causal Model, the method that facilitates relationships between elements and uses refined and specific information. It involves statistical measurements and calculations, such as regression model, hence the ability to

measure relationships (Chambers, Mullick, & Smith, 1971). Some of the described methods regression included could be useful for the research covered in this paper. However, this method implies high specificity of information and less reliance on historical data in comparison to Time Series, as COVID-19 outbreak in an unprecedented event that is so recent that not enough information is available on the subject and enough specificity can hardly be achieved. Therefore, out of the 3 types described - Time Series Analysis is the most appropriate method to use as the variable that needs to be tested can be traced by seeing the deviations from the historic norm during the period of uncertainty that the outbreak is. Time Series Analysis with graphical plotting and statistical elements is the chosen method of forecasting for the study and will be covered further in Methodology and Findings chapters.

## **2.7 Summary**

To shortly summarize on what has been stated in this chapter, the information covered is primarily fact-based at its core, meaning it merely shows whether or not something has happened, but not necessarily why it happened and how it could have affected other variables in the chain of events. For instance it can already be claimed that COVID-19 cases have gone up and down at the recorded dates or that empirically the sales of certain goods have been fluctuating across sales channels such as traditional retail and online retail, with online retail showing better performance at respective recorded dates and value numbers. It was discussed how online retail has been functioning in recent years and what dynamics were observed under market conditions more predictable than the ones during the ongoing outbreak and why the segment growth can be anticipated in the upcoming years. The section covered the decisions made by the government as well to showcase the context of market conditions as not the infection cases directly caused the shopping paradigm to shift as much as steps taken by authorities could cause an effect on the performance of the retail sector. Notably, it is also important to highlight the possibility of emerging trends to stay in place for an extended period of time, as people have reported that some services such as Online Banks they would prefer to continue using further on. Therefore, substantial part of this research is aimed at determining the effect of

COVID-19 on retail in both short and long run, as that would allow the humanity to make higher accuracy predictions for upcoming global events if market performance can be directly linked to certain restricting measures, in the upcoming times once will be necessary the measures can be evaluated and a different approach used to maximize not only effectiveness but also be able to preserve and assist the market as much as possible. The Literature Review section has also addressed various tactics and approaches that can be taken in order to achieve forecast accuracy, making it reliable to be used in longer runs and thus possible to adapt commercial practices to the extraneous macroeconomic conditions. During the discussion is has also been shown what technique will be used for the current study in hope to achieve meaningful results.

However, it cannot be yet claimed that one event happened because of the other, for now it can only be assumed. Therefore, the aim of the next section titled Methodology is to go further in-depth on the matter and determine whether or not the data described can be attributed and tied together to the mentioned events.

### **3 Methodology**

This section is primarily aimed at describing the techniques and ideas implemented in the conducted study as well as further discussion on the data presented and what it can tell about the effect of COVID-19 outbreak could have on the examined industry. All the computations necessary to prepare data for desired analysis as well as some of the graphs and tables shown are done in Microsoft Excel.

#### **3.1 Research Design**

##### **3.1.1 Quantitative Analysis**

Quantitative Analysis is a method that is meant to analysis primarily numerical data, with the usage mathematical and statistical measurements. It is used heavily when analyzing past events and forecasting future ones such as for instance financial

instrument valuations and macroeconomic shifts (Kenton & Anderson, 2020). Based on this definition it was decided that this form of analysis is most fitting for the anticipated research as it revolves around analysis of historical data to make future predictions as well as uses quantifiable, tangible information that doesn't need further definition than it's numerical value.

### **3.1.2 Time Series Analysis**

Time series is a series of numbers ordered with respect to relevant time periods for each number (Peixeiro, 2019), allowing to track the change of a given variable over that time period, see how it fluctuates and analyze it's behavior. Given the nature of the study it is understandable that time series is a viable option for usage as it would allow to keep track of value, volume and infection rate for the variables that that are being reviewed in the study. The data itself will be more touched upon later in the chapter, however it can already be stated that the data taken is raw and therefore seasonality will need to be first smoothed out for the data to show useful results later in the study. Raw data in this case means unedited (Christensson, 2006) meaning there was no additional manipulation with the estimations that were made, the original data. The main two Time Series that will be used in this research are the Time Series of infection rate in the United Kingdom for COVID-19, and the Time Series for averaged out weekly online sales in millions of pounds. Additionally however the Time Series of all retail sales as well as offline only retail sales will be used for drawing comparisons to the main data provided as well as additional context of the case study.

### **3.1.3 Seasonality**

Seasonality is a linear or non-linear component that changes over time and does repeat forming a pattern that can later be seen in the trend line (Christensson, 2006). If the data is not seasonally adjusted how it is in this case then it could be challenging to see any form of trend as it is likely going to be repeating our with peaks and troughs

in the respective months usually repeating annually. One of the ways how to deseasonalize a data set is finding its moving average (MA) and centered moving average (CMA) that allow to smooth out the discrepancies in data and help isolate the seasonal component, that can later on be used to find a trend and eventually make a forecast based on the deseasonalized data. The centered moving average that appears as a byproduct of cleaning up a dataset can be used as a form of trend line to show how the data with no seasonal components would look like if talking solely the direction of where the trend is heading over time.

### **3.1.4 Moving Average and Centered Moving Average**

#### ***3.1.4.1 Moving Average***

Moving average is a series of averages of subsets within one dataset, that can showcase averaged change in the data overtime (“Moving average definition”). The method can be used in identifying patterns in growth/decline momentum that can point to a certain seasonal trend, as it shows direction of the values movement in the dataset. In the research described and carried out in this paper, the Moving Average is used as an intermediary step towards ‘smoothing’ the raw data presented and understanding the general performance of retail sales in the given time period. (Fernando, 2021)

#### ***3.1.4.2 Centered Moving Average***

Calculating the Centered Moving Average or the CMA is the next step of preparing the dataset for deseasonalization, that involves averaging the Moving Average values. This is necessary as the number of values per subset is even in the case of this research paper, meaning that there are 12 months in 1 year. Therefore, if only the MA is calculated, there is no midpoint that could be assigned to a subset, the CMA is therefore calculated to show the midpoint and narrow the dataset further to ease the upcoming steps of data cleansing. When looking at a dataset visually it can be observed that after the Centered Moving Average, the dates are aligned back to their

corresponding values, unlike with just a single Moving Average (“Predictive Analytics with Microsoft Excel: Working with Seasonal Time Series”, 2015)

After the additional smoothing, the dataset created can also be referred to as a double moving average, as in essence the CMA is repeating the same process on an already smoothed dataset (Hyndman, 2009)

### **3.1.5 Regression**

Regression is a statistical concept that allows to determine the strength of relationship, if present, between the dependent variable and the independent variable (Beers & Anderson, 2021). In the case of this study the independent variable is the number of daily COVID-19 infections in the United Kingdom whereas the dependent variable is the averaged out weekly value of all retail purchases that were done online prior and during the pandemic, however the regression was used for a measurement of seasonal components that would later allow to calculate the Trend values using the intercept coefficient.

### **3.1.6 Root Mean Square Error**

The root mean square error is the standard deviation of the residuals, meaning it can showcase how far the values are from the line of best fit (Glen, n.d.). In the case of this study - RMSE was used to determine how close the original values were to the values of the forecast, in order to add an extra layer of security and validity proof so valuable results can be achieved.

## **3.2 Sampling and Data**

The data used in this research is provided by the Office for National Statistics of the United Kingdom, the data is referred to by the author as a ‘first estimate’ of retail sales (Dalglish, 2021), however the ONS is the largest independent producer of official

statistics in the UK and is generally considered a respected and trusted establishment (ONS, “About us”) therefore it is likely that the data found there is the closest to actual values that is currently available, making it highly useful for a real-life scenario analysis that a case study is.

The data report covers Retail Sales in the United Kingdom, the dataset is recorded in millions of pounds and varies from monthly data to averaged out weekly data. It was decided to bring the data to the common denominator of weekly sales, as it is the shortest available time period available in the data report. The data was found nearly ideal for the Time Series analysis as it is sorted with time factor in mind and each corresponding value is attached to a specific date or time period allowing for its graphical plotting and further analysis. The two datasets used out of the Retail Sales Report are the Retail Sales in Pounds and Retail Sales Index internet sales data, both sets are non-seasonally adjusted.

The data containing the dynamic of retail operations needs to be compared to the data showing COVID-19 infection rates in the United Kingdom in order to compare the trends in value fluctuations. It is once again best to retrieve the statistics from official sources so the values of infection cases come from the governmental data center that keeps track of everything COVID-19 related in the country. The data makes it on the list from lab-reported cases (or lateral flow device for England only), it represents the number of people that has tested positive for COVID-19 at least once, each person is only counted once on the day of their first positive result to avoid repeating cases (“Official UK Coronavirus Dashboard”, 2020).

It would take a long time and a lot of effort to fully define and describe the sample of this study, as it includes an entire population of a country, likely involving nearly every class, age and ethnicity there can possibly be, therefore it can be claimed as representative as the study revolves around the United Kingdom and these datasets display contributions from any member of the target population.

## 4 Findings

This section is aimed at highlighting the technical processes of conducting further analysis on data mentioned in the Methodology chapter as well as the results that those results show and the respective contributions towards the initial research question determining the effects of COVID-19 on retail sales.

Notably, all datasets are ordered according to time, meaning that time factor is assigned to each value numbering the total amount of input values as well as showing the order that they must be listed in (see Table 1). The number assigned to each value will be used in some of the further calculations necessary to analyze the data and modify it to achieve desired results.

t	year	month
1	1990	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10
11		11
12		12
13	1991	1
14		2
15		3

Table 1. Visualization of Time Component

The original two datasets used to start are ‘All retailing excluding automotive fuel’ starting in January 1990 through January 2021, expressed in millions of Pounds Sterling and represent the total value of goods purchased, the dataset is expressed in



monthly intervals meaning 12 values annually. The aim of using this dataset was to be able to see the general trends in retail sales and consumption over an extended period of time.

The second dataset used is “Average weekly online retail sales” recorded from January 2007 through January 2021, similarly to the previous dataset it is also expressed in millions of Pounds Sterling and provides monthly values, 12 times a year. This dataset can show directly how the online segment of retail has been performing over the recorded period of time. In addition, a third dataset was derived from the original two, an “offline retail sales” set was calculated by subtracting the online only retail values from the all retail values for dates January 2007 through January 2021 to match the online retail data in amount of values.

The datasets are expressed in different time units, average weekly values vs monthly values, therefore it was decided to bring all data to the ‘common denominator’ and convert the first dataset into averaged weekly values by averaging the monthly values by the respective number of 7-day periods in the given month for better correspondence with the online retail sales data (see Table 2).

		Cases Per Month	# of Weeks (7 days)	# per week (average)
2020	2	46	4,14	11,11
	3	38394	4,43	8 666,82
	4	138876	4,28	32 447,66
	5	78946	4,43	17 820,77
	6	28296	4,28	6 611,21
	7	20680	4,43	4 668,17
	8	34009	4,43	7 676,98
	9	150049	4,28	35 058,18
	10	573932	4,43	129 555,76
	11	600240	4,28	140 242,99
	12	993655	4,43	224 301,35
2021	1	1195781	4,43	269 927,99

Table 2. Average COVID-19 infection rate per week.

The following description of technical method applies to all 3 earlier mentioned datasets. After the data was unified, it was necessary to find the Moving Average, showing the average value number for 12 values shifting by a single value with each next Moving Average, after that, same procedure was done to the MA when it was averaged in pairs, with each shift being one value down the timeline. The values calculated created the Centered Moving Average that has allowed to see the data with significantly smaller seasonal discrepancy and get the general idea of the trend of purchases over time (see Fig. 11,12 & 13).

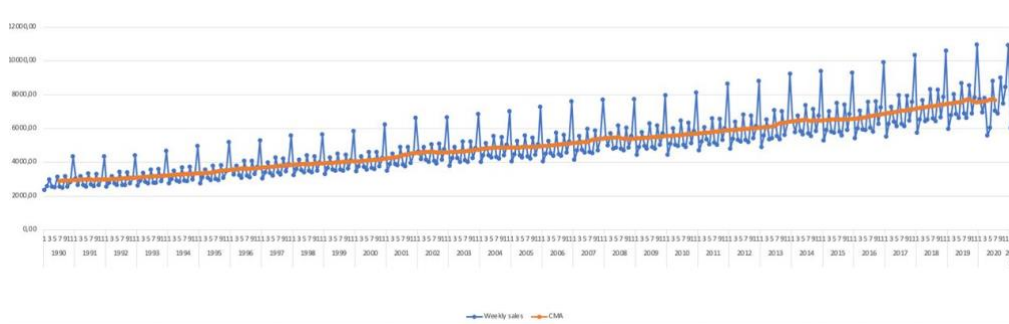


Figure 11. CMA of all retail sales in the UK.

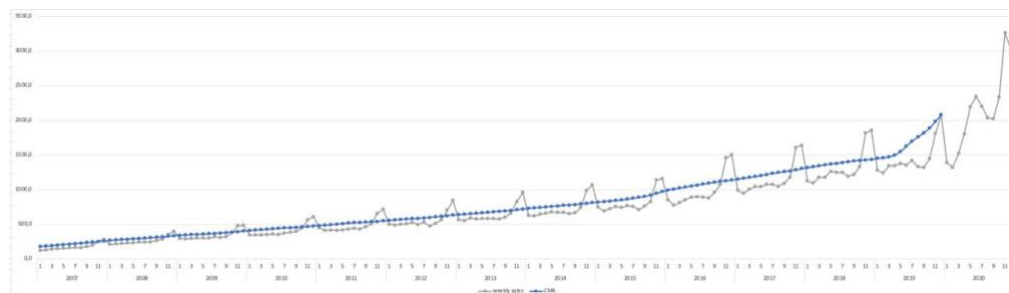


Figure 12. CMA of online retail sales in the UK.

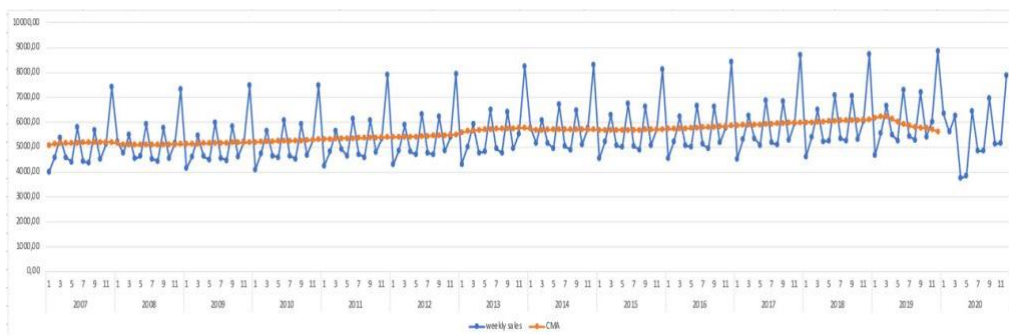


Figure 13. CMA of offline retail sales in the UK.

This has allowed to isolate the seasonal component for each month of the year, for every year that a given dataset contains. The seasonal component is a useful indicator for evaluating the seasonality of the data as it showcases how far and to what direction does the value in the given period fluctuate in relation to the averaged out value across all seasons. The neutral value of 1 means generally no seasonal deviations in the given month, with numbers deviating from 1 showing which direction the discrepancy is leaning towards, whether there are more than average purchases expected or less than average (see Table 3).

Month	St (All retail)	St (Online)	St (Offline)
1	0,86	0,93	0,87
2	0,92	0,93	1,10
3	1,07	1,22	0,99
4	0,90	0,96	1,01
5	0,87	0,96	1,06
6	1,14	0,94	0,89
7	0,89	0,92	0,88
8	0,86	0,95	1,13
9	1,12	1,22	1,02
10	0,90	0,98	0,81
11	1,02	0,94	1,07
12	1,45	0,92	0,88

Table 3. Seasonal components of retail sales in the UK.

After the seasonal component was determined it was made possible to fully deseasonalize the original data as the component allowed to estimate to what extent each of the values needs to be 'smoothed' to achieve seasonally adjusted data.

The next objective of the research after smooth data was obtained is to calculate the trend of market movement in the discussed retail segment by factoring the time component into the newly acquired data. To begin, a linear regression of deseasonalized values and time component was ran as well as an ANOVA test, that

allowed to see the the intercept coefficients as they are necessary to calculate the trend values. The regression has shown through R Square value that the model is generally well-fit in comparison to the real life data-points and the correspondence of 'new' data is evident in relation to the time factor. Intercept coefficients are showing what the value of X/Y variable would be if the opposing variable was equal to zero (see Tables 4, 5 & 6).

#### SUMMARY OUTPUT ALL RETAIL

<i>Regression Statistics</i>			
Multiple R		0,987064531	
R Square		0,974296388	
Adjusted R Square		0,974227106	
Standard Error		232,1794114	
Observations		373	

<i>ANOVA</i>			
	<i>df</i>	<i>SS</i>	<i>MS</i>
Regression	1	758085611	758085611
Residual	371	19999600,53	53907,27907
Total	372	778085211,5	

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	2542,69119	24,09201466	105,5408286
X Variable 1	13,24000237	0,111648436	118,5865463

Table 4. Regression and ANOVA of all retail sales.

#### ONLINE RETAIL

<i>Regression Statistics</i>	
Multiple R	0,863806166
R Square	0,746161092
Adjusted R Square	0,744622675
Standard Error	301,7258691
Observations	167

<i>ANOVA</i>			
	<i>df</i>	<i>SS</i>	<i>MS</i>

Regression	1	44155361,81	44155361,81
Residual	165	15021352,52	91038,5001
Total	166	59176714,33	

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	-65,2414185	47,32767785	-1,378504534
1	10,66634008	0,484324289	22,02313682

Table 5. Regression and ANOVA of online retail sales.

#### SUMMARY OUTPUT OFFLINE

<i>Regression Statistics</i>			
Multiple R		0,245500838	
R Square		0,060270662	
Adjusted R Square		0,054360414	
Standard Error		1362,188827	
Observations		161	

ANOVA			
	<i>df</i>	<i>SS</i>	<i>MS</i>
Regression	1	18922343,62	18922343,62
Residual	159	295033785,6	1855558,4
Total	160	313956129,3	

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	5152,415095	217,7217293	23,6651395
1	7,376454176	2,309922984	3,193376674

Table 6. Regression and ANOVA of offline retail sales.

After adding up the coefficient values and factoring in the time component it is possible to estimate the values of the trend line showcasing deseasonalized historical data, that could serve as base for forecasting further market performance. To finish the forecasting process it is only left to multiply the trend line values by their corresponding seasonal factor. Once that is done the forecast values are obtained and can be estimated further into the future to predict the seasonal sales as well as growth dynamics, based on previous performance (see Fig. 14, 15 & 16).



Figure 14. Forecast of all retail sales

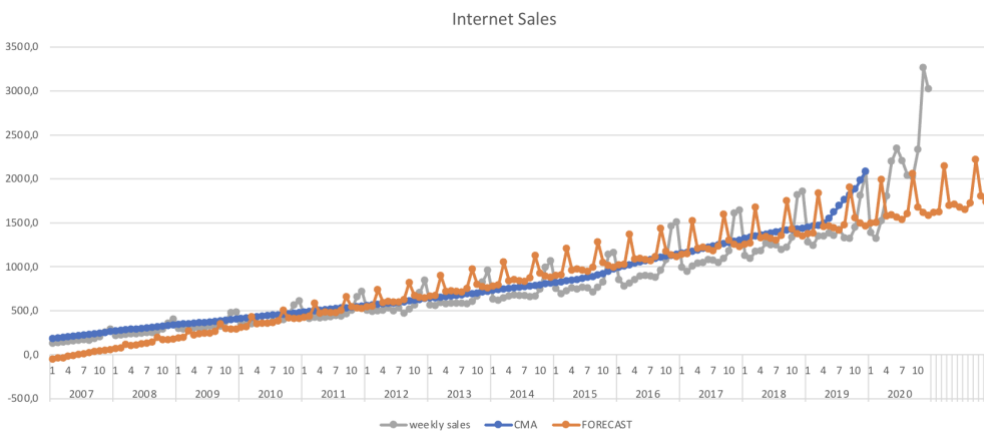


Figure 15. Forecast of online sales

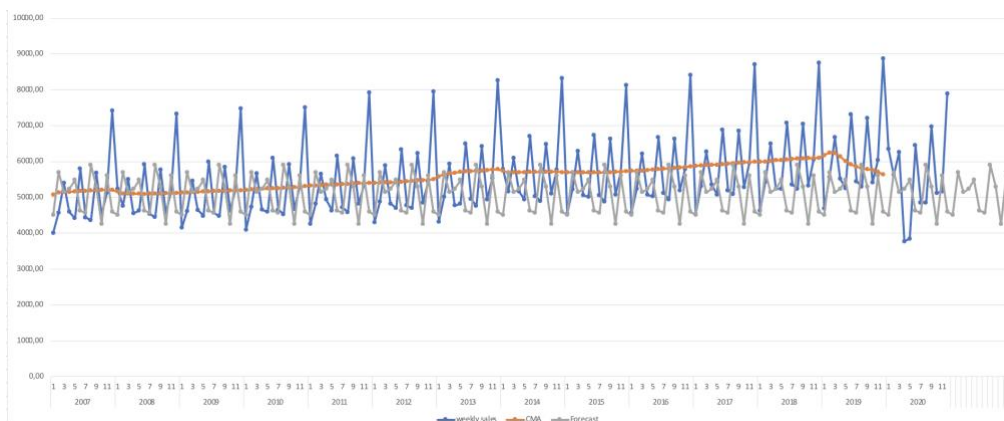


Figure 16. Forecast of offline sales

The final step towards facilitating the results of forecast estimation is to calculate the Root Mean Square Error value that allows to see the accuracy of the forecast when compared to real-life historical data. It can be observed that the accuracy of the offline-only forecast is lower than of the other two as more errors were found, this

however does not significantly negatively affect the research as this dataset was made and intended to be used for the sole purpose of seeing the dynamic that has already happened in order to highlight the more drastic change in online retail (see table 7). The other figures though still show errors to a certain extent, the values are within the appropriate threshold deeming the forecasts close enough to reality in the context of this very research.

RETAIL TYPE	RMSE VALUE
All retail	216,22
Online	296,09
Offline	1365,72

Table 7. RMSE values of retail sales forecasts.

Despite the varied forecast reliability, the RMSE values still do suggest the inability to rely solely on history-based forecasting as the projections will not always stick to the seasonal trends accurately enough for it to be considered reliable for adapting short-term to the market movements. However with this level of accuracy the forecasts can still be used to derive long-term shifts and new equilibriums in the industry.

The next step is to introduce the data of COVID-19 infections in the United Kingdom and observe whether it can be related to the newly found projections for Retail Sales. The data that was taken came from the governmental data center where it has been recorded daily, the data was then converted into monthly and averaged out for the weekly rate to match the retail sales data. There is no need to re-adjust this data as it is not complete enough to look for seasonality due to how recent this occurrence is. After the appropriate form of data became available, it needed to be graphically plotted to visually see the trend line and its dynamic (see Fig. 17).

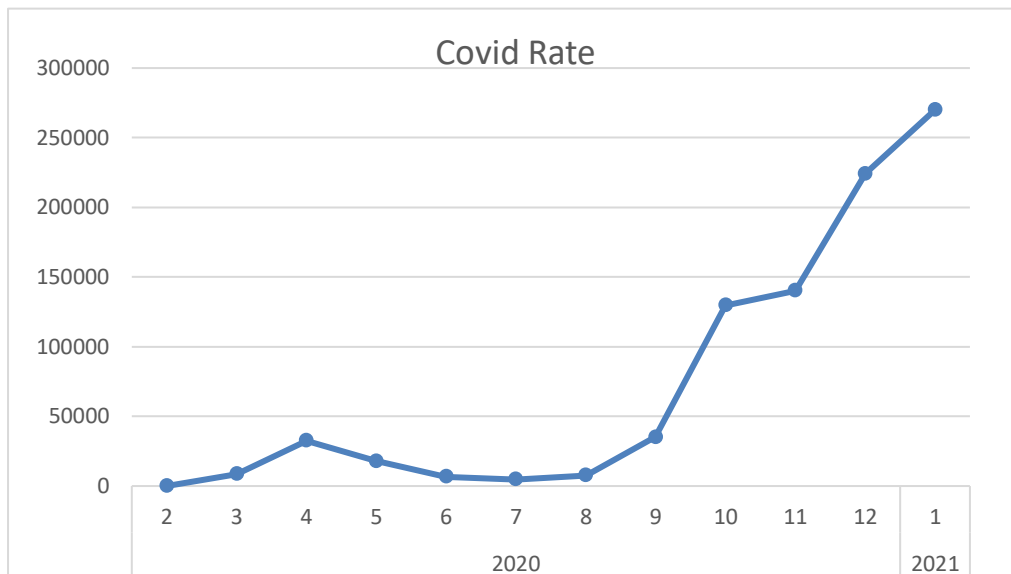


Figure 17. COVID-19 Infection rate in the UK.

To answer the research question it is most important to look at the online-only values that have emerged as the result of forecasting, with their real-life figures and the earlier mentioned infection rate. Looking at the curves on the online-only graph, there is a significant difference in historic data of sales and the historic data backed forecast, the discrepancy becomes evident in the beginning of 2020. Placing the graph of COVID-19 infection rate it is apparent that the trends are corresponding as the values rise and fall at similar if not same time periods, nearly simultaneously (see Fig. 18). The COVID-19 pandemic was by far the biggest disruption the retail market of a country could have and if there would be no other disruption present, without COVID-19 it is likely that the market trends would follow the forecast line closer as it has proven itself to be close to reality in comparison to the available data, thus the assumption that one effected the other could be interpreted as close to reality based on the information present.



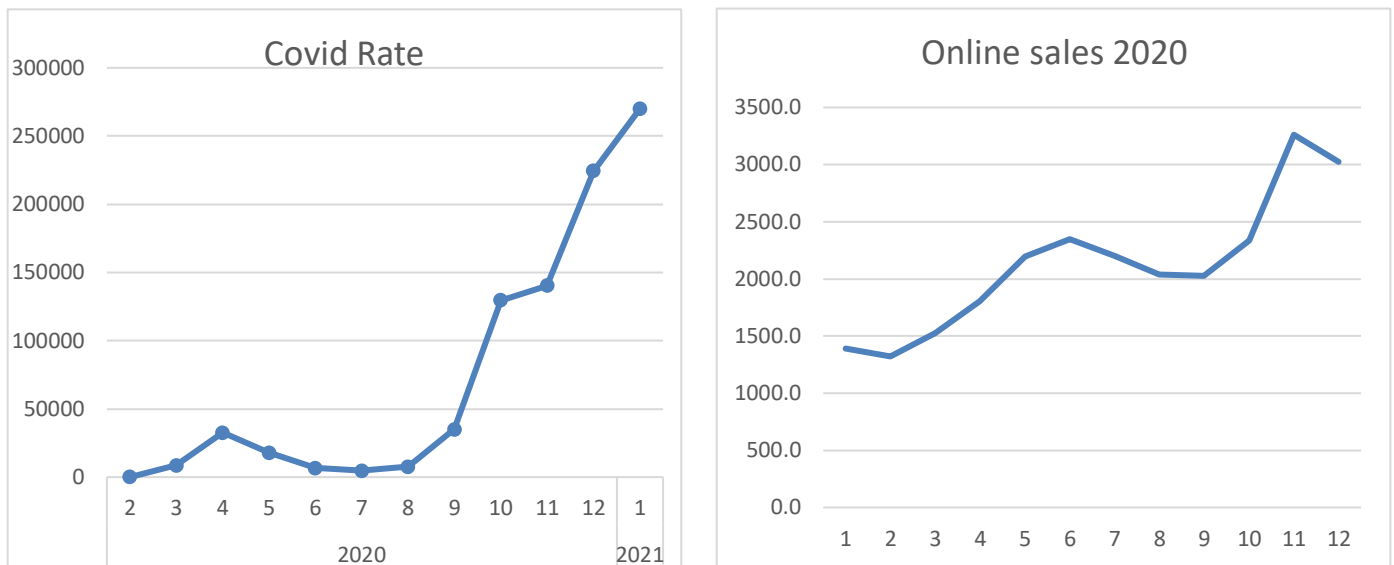


Figure 18. The comparison between the COVID-19 Infection rate and online retail sales in the UK for year 2020. Source: ONS

## 5 Conclusion

In this section I would like to further consolidate and conclude the results obtained, outlined in the previous section of the paper as well as include a discourse on how the results that were achieved can be used in the future and what could be expected long term from the United Kingdom’s domestic retail market based on the forecasts that were derived.

By analyzing Time Series of various retail markets, it was possible to determine the relationship between the independent variable “COVID-19 infection rate” and the dependent variable “retail sales online”. Judging by the numbers that have appeared after data smoothing, their visual representations and the implied nature of those two variables interlinking, that was expanded on in the “Literature Review” chapter of the paper, the effect of one variable on the other could be present. It's indicating the possibility of COVID-19 outbreak attributing to the

shift in consumption in the UK and even be labeled as the reason for this, largely forced, change in customer behavior and ratio of revenue delegated to each sales channel of a retail company. Therefore, when going back to the research question “Does the COVID-19 outbreak have an effect on the online retail sales in the UK?” - the short answer is yes, the covered data does suggest so as of now.

However, it is not as important to solely understand the relations of one occurrence to the other and how far the relation goes in the context of short-term market fluctuations as shown in the time series as much as the general understanding of future market trends that this information bears. As shown the fluctuations of the infection rate are inevitable and come in seasonal waves just like the sales tend to, yet it is unlikely that the popularity of online sales will move accordingly long-term, once all the necessary infrastructure to conduct online retail practices is widely adopted by companies to maximize customer convenience. When assessing the growth, specifically looking at the CMA of internet sales value (FIGURE 12), the notion that arises is that the market share of online retail is likely to find the new equilibrium post-COVID as not only the purchasing process will be made easy in the masses, but also due to COVID-19 related restrictions have been in place for over a year at the time of writing, that inevitably leads to a shift of habits in the consumer’s behavioral traits and thus it has already been polled that certain industries are likely to experience comparable demand online after coronavirus, as they do during the measures imposed (Calugar-Pop & Lee, 2020).

When discussing solely the forecast created through time series and comparing the performance to the available historical data it becomes evident that its accuracy is not necessarily a guarantee. For instance, the accuracy of forecasting of all-retail is very close to the real-life values, as it can be seen the lines of time series and the forecast are nearly identical (see Fig. 14), however when looking at the online sales dynamics, it can be observed that if this was the only forecast to be used to prepare a plan for the year at the end of 2019 (see Fig. 15), it would not be a very good plan as it did not factor in the unexpected event of COVID-19 outbreak happening as it was created basing on past data only. With that in mind, it is once again important to

outline the importance of general trend understanding when making long-term adjustments in a retail business rather than relying on short term fluctuations.

So what could this new equilibrium mean for retail businesses in the future? For large scale retailers this should serve as the point of departure towards further research and implementation of online sales channels into their business model, as it is not the first time a large, well-established brick-and-mortar firm loses its market and customers tremendously to a new upcoming company that puts emphasis on internet retailing. Taking for instance the case of Sears that was one of the first large retailers to launch a website sales channel but eventually losing its positions to Amazon largely due to 'failing to ignore' their brick-and-mortar portfolio and therefore missing on customers (Wahba, 2019). The scale of the pandemic brought the point across that the online retail segment has potential to bring in significant revenue portion, and ignoring that would be a missed opportunity for any large business.

As to smaller retail business, or someone in the process of preparing to launch a personal business, the information regarding growth of demand for products available online should serve as a guide in which direction to make the initial step when launching. An average start-up in the UK requires roughly 5000 British Pounds to launch, with a share of that launching cost attributed to expenses such as office and retail space and supplies for the premises (Hutchings, 2020). If a decision is made towards online business model, that could save funds at launch on those business expenses that are not required to operate online, thus decreasing risks at the very start.

Regardless of the retail business' current size and offered selection, the main takeaway from obtained results and what the corresponding literature suggested is the outlined importance of having an online presence, as online ecosystem is largely independent from offline and is responsible for both product discovery and inspiration as well as order placement, meaning that the advertising practices have to shift as well to accommodate the newly acquired internet customer.

To summarize and conclude further, the research has provided answers for the broader question of the long-term effect of the outbreak on sales and behavior in following ways.

Long term effect is expected to create the new average level of online consumption, higher than pre-COVID and likely won't return to the old values, as the shift has already begun and the average United Kingdom consumer has understood the possible upsides of consuming through internet, which brings it to the point of customer adapting their behavior towards a more online-friendly attitude that will most likely be a trend for the few upcoming years. The ongoing shift and the change of attitudes induced by the pandemic both imply an increase in volume and value of sales done online and this is what the results of available data analysis in this study have shown in the United Kingdom.

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