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Inclusion of the shipping sector in the European Carbon Emissions Trading System (ETS): Impacts on Panamax (4TC) and Capesize (5TC) freight rates and their time-varying risk model

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**Inclusion of the shipping sector in the European Carbon Emissions Trading System (ETS): Impacts on Panamax (4TC) and Capesize (5TC) freight rates and their time-varying risk model**

**Master of Science in Commodity Trading**

Submitted by

VON WATTENWYL Isabelle

Under the supervision of:

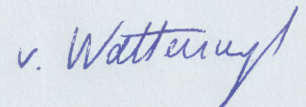
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*/certify that the work presented here is, to the best of my knowledge and belief, original and the result of my own investigations, except as acknowledged, and has not been submitted, either in part or whole, for a degree at this or any other University.*

Signature



Date

29<sup>th</sup> July 2022

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## **Abstract**

The shipping sector is in the spotlight. Alone, emits about 3% of CO<sub>2</sub> emissions. There is no denying the ecological and environmental impacts. Transporting around 11 billion tons of raw materials and finished products each year, the sector has undergone a huge expansion in the last four decades and has strongly contributed to globalisation, including trade between different countries and cultures. However, the industry is also very polluting and harmful to the environment and is certainly a significant contributor to the global warming we are currently experiencing. It was obvious and necessary that the shipping sector had to be curbed and that stricter regulations on environmental conservation and targeted action to restrict global warming were needed.

The European Commission has taken matters into its own hands and has decided to integrate this industry into the European Trading System (ETS) from 2023. The main aim of this project is to align the different sectors with the target set by the European Union, i.e., a 55% reduction in greenhouse gas emissions by 2030. It will be necessary in the coming years to introduce new restrictions, some of which may be introduced by the International Maritime Organisation, to try to reduce our emissions as much as possible and protect our planet as best we can.

These new regulations have prompted some questions from experts such as who will have to pay the price of carbon, ship owners, charterers, or consumers? All these questions trigger challenges for the European Commission who are the key players to address these issues to allow a smooth and efficient implementation.

The purpose of this thesis project is to analyse the impact of the inclusion into the European Union Trading System on Capesize (5TC) and Panamax (4TC) freight rates by using time-varying risk models.

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## Glossary

<b>BCI</b>	Baltic Exchange Capesize Index
<b>BDI</b>	Baltic Exchange Dry Index
<b>BFI</b>	Baltic Freight Index
<b>BHMI</b>	Baltic Exchange Handymax Index
<b>BIFFEX</b>	Baltic International Freight Futures Exchange
<b>BIMCO</b>	Baltic and International Maritime Council
<b>BPI</b>	Baltic Exchange Panamax Index
<b>CII</b>	Carbon Intensity Indicator
<b>DWT</b>	Dry Weight Tonnage
<b>ECAS</b>	Emission Control Areas
<b>ECB</b>	European Central Bank
<b>EEDI</b>	Energy Efficiency Design
<b>EEX</b>	European Energy Exchange
<b>EEXI</b>	Energy Efficiency Existing Ship Index
<b>EUA</b>	European Emissions Allowances
<b>EU ETS</b>	European Union Emissions Trading System
<b>FFA</b>	Forward Freight Agreement
<b>GAAT</b>	General Agreement on Tariffs and Trade
<b>GHG</b>	Greenhouse Gases
<b>HFO</b>	Heavy Fuel Oil
<b>ICE</b>	Intercontinental Exchange
<b>ICS</b>	International Chamber of Shipping
<b>IMF</b>	International Maritime Fund
<b>IMO</b>	International Maritime Organisation
<b>ISM</b>	International Safety Management
<b>LNG</b>	Liquid Natural Gas
<b>LOA</b>	Length Overall
<b>LSFO</b>	Low Sulphur Fuel Oil
<b>MARPOL</b>	International Convention for the Prevention of Pollution from Ships
<b>OTC</b>	Over The Counter
<b>PNL</b>	Profit And Loss
<b>TEU</b>	Twenty-foot equivalent units
<b>ULCC</b>	Ultra Large Crude Carriers
<b>VLCC</b>	Very Large Crude Carrierst
<b>ZCFI</b>	Zero-Carbon Freight Index

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# Chapter One

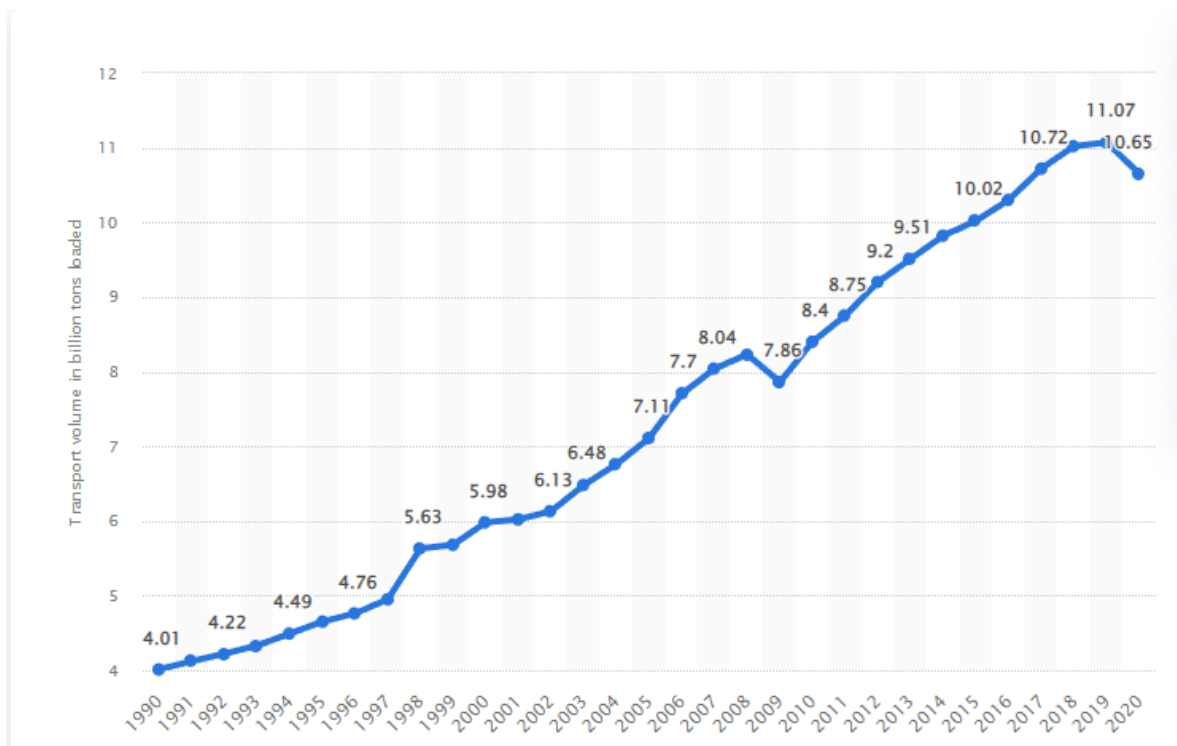
## Introduction

For about 5000 years, the shipping industry went through several phases and major changes that led to the actual global trade scheme. From the primary shipments of copper, oil, and certain types of fruits such as dates in Mesopotamia, through the opening of the Mediterranean trade Canal and the rise of the Greek shipping influence and the discovery of global trading routes in the fifth century, thanks to the voyages of Christopher Columbus, Vasco de Gama and many others, economies across the world became highly globalised. The Council of Europe defined globalisation as

The ever closer economic integration of all the countries of the world resulting from the liberalisation and consequent increase in both the volume and the variety of international trade in goods and services, the falling cost of transport, the growing intensity of the international penetration of capital, the immense growth in the global labour force, and the accelerated worldwide diffusion of technology, particularly communications. (Council of Europe)

Indeed, it can be represented as a strong link between all market players that intensified throughout the decades and with the evolution of technologies, making exchanges much more efficient and rapid than before. Nowadays, it is no longer surprising to find highly processed food products, such as well-known soda brands, or a high-performance Internet network in remote areas of the world, which shows us the scope of globalisation has taken place worldwide. This unprecedented growth of the economy in general but more specifically the maritime sector has obviously been helped by the technological advancements that have allowed it to go from primary sailing ships with a simple wooden hull to steamships in the nineteenth century and then after many years of technological improvements to maritime transport behemoths, the largest built measuring approximately more than 1'500 feet (450 meters) and capable of transporting an astronomical quantity of raw materials throughout the world. With the growth of the tramp and liner shipping system, many new transport possibilities rose. We started to transport commodities

in bulk, liquid or refrigerated forms but also passenger and of course containers from 1950 onwards. The Bretton Woods conference in 1944 led to the creation of the World Bank and the International Monetary Fund (IMF) and later to the creation of the General Agreement on Tariffs and Trade (GAAT) that had a huge impact on the shipping industry, by giving countries much more independence and by opening a real trade system that is no longer based solely on the personal production of these countries but allows them to exchange their respective production among themselves. From the 1950s onwards, maritime transport evolved at great speed. The consumption of metals such as aluminium, steel and coal for power stations exploded due to the growing demand for electricity, rail transport and the production of cars for the population. The two oil crises in the 1970s led to the development of trade with Asian countries and the opening of trade with China marked the beginning of a globalised economic system. In terms of volumes and statistics, for example, the maritime transport sector has increased from 4.01 billion tons loaded in 1990 to 10.65 billion tons in 2020 as shown on *Fig. 1.*, confirming this significant rise and the importance of the maritime transport sector for our economy.



**Fig. 1 Transport volume of seaborne trade from 1990 to 2020 (in billion tons loaded), Worldwide maritime trade - transport volume 2020 | Statista**

In his book *Maritime Economics*, Martin Stopford provided a list of the major sectors contributing to both the world's economy and maritime transport, which are the following: "energy (with oil, gas, and coal); mining (metal ores and other minerals); agriculture (grains, oilseeds, refrigerated food, vegetable oils and live animals; and forestry" (Maritime Economics, chapter 2.4). According to Martin Stopford, the energy sector contributes approximately 44% of the world seaborne trade and the mining approximately 18%, therefore the shipping sector is highly affected by improvements and/or disruptions in those two activities. This is even more important for Capesize and Panamax vessels, which transport most of the world's iron ore and coal. As far as transport costs (or freight cost) are concerned, they have also gone through several phases in the last few centuries. For instance, in the 1950s, transporting goods was much more expensive than nowadays and therefore, the companies strategically chose to reduce the freight costs for their shipments as much as possible. Then, as of 1990, the transport costs decreased significantly while on the other hand raw material prices increased, therefore freight cost became much less important in the companies' financial decisions. However, we should not forget that in the short run, the impact of an increase in the price of raw materials and a decrease in the cost of transport will be minimal because demand for this type of product is generally quite inelastic, which means that consumers do not necessarily reduce their spending because these are basic necessities, which they need either for their production or for their direct resale.

It is not only raw material prices and transport costs that have allowed the shipping market to become more efficient over the years, but also other factors such as the massive improvement of ports and discharge locations, which are becoming more efficient in reducing the waiting time of ships to a minimum. Moreover, with the advancement of ship building technologies, vessels have become more efficient and can now carry large quantities of goods using their maximum capacity. In addition, a practice which originated in the 1920s and which has become very common today and raises political and economic debates is that of signs of convenience. "International law requires every merchant ship to register in a country. The country of registration is the ship's "flag state." Ship registration gives the ship its nationality, even when it differs from that of the owners." (Naylorlaw, 2019) The vessels are then required to apply the country's maritime and social rules. What is surprising and what makes the subject contentious is that approximately seventy percent of

the world's merchant fleet were registered under foreign flags such as Panama or Liberia (but not only), countries in which the laws on the protection of seafarers but also on the safety of ships are much more lenient than in the rest of the world. Therefore, by using such practices ship merchants hope to make a quick profit by using old ships and abusing human rights on the seafarers working on those vessels. These practices, although controversial, have also allowed many shipping companies to reduce their costs, by benefitting from a tax and legal advantage by choosing to register their vessels in another country.

In the next chapters we will detail the two types of vessels we will analyse, namely the Capesize and the Panamax, explain the basics of the maritime transport market as well as the freight derivatives market and end this thesis project with a comparative analysis between specific time-charter freight rates and analyse the impact of an inclusion of shipping in the European Emission Trading System (EU ETS) on these different rates.

## **Chapter Two**

### **Literature Review**

This chapter is used to introduce the basis of our research topic and to put into word the knowledge acquired using supporting documents such as books, articles etc..., thus creating a foundation for our research question. This chapter provides an overview of all the topics which are analysed further in our thesis work. Then, we will detail the Data and Methodology in chapter 2, which is the beginning of our analytical part. To introduce the subject and research question, we first need to provide some explanations for Capesize and Panamax vessels, whose freight rates are components of our analytical part. It is also important to explain the basis of freight market and freight derivatives as they are used as a risk management tool for shipping companies and other market players. Furthermore, our thesis project has as main subject the decarbonisation of the shipping industry and the inclusion of this industry in the European Emission Trading System (ETS). We will detail the process put in place by the European Union to include this sector and crystalize the impact it will generate for the whole industry in the short- and long-term.

As part of our analysis of the freight rates and the future impact of new carbon regulations, we will focus on two types of ships. First, we will look at Capesize then Panamax vessels and understand their fuel consumption system and get a more global view on the use of this type of transport in future years. Firstly, Capesize vessels are the largest cargo ships used for carriage of dry bulk. With a dry weight tonnage (DWT) usually higher than 150'000 tonnes and measuring more than 230 metres they are much larger than Panamax vessels which are detailed below. Another point that is important to mention is that, due to their size, Capesize ships can only sail in deep water and reach terminals that were built with very deep access. Therefore, they cannot cross the Panama Canal and must sail a longer distance through the Cape Horn. This increases the travel time but also the fuel consumption, which is very polluting. Capesize vessels are usually used to transport minerals such as coal or iron ore. If they transport crude oil they are categorised as very large crude carrier (VLCC) or ultra large crude carrier (ULCC).



**Fig. 2 Capesize vessel, Freight Rates for Bulk Carriers May Triple as Fleet Expansion Slows (gcaptain.com)**

On the other hand, we have the Panamax vessels, smaller with a dead weight tonnage of approximately 65'000 to 85'000 tonnes. For the New Panamax vessels built later the deadweight can increase until 120'000 DWT. Because of its size this type of vessel can cross the Panama Canal and therefore save precious time. Usually, this type of vessel transports either bulk or containers with a capacity between 5'000 and 13'000 twenty-foot equivalent units (TEU), the shipping unit to categorise the container transport. Some cruise ships can also be characterised as Panamax ships, but they are not relevant for our analysis.



**Fig. 3 Panamax vessel Freight, Chartering, Operations and more: Types of bulk carriers (freight-charter.blogspot.com)**

Then we are interested in understanding the energy impact of these maritime behemoths, what fuel the engines use and how their emissions impact our planet and how they contribute to global warming. The fuel vessels use is called bunker fuel and each vessel can operate with different types of bunker fuel and most of the time with a mix of various ones. First, we have Heavy Fuel Oil (HFO) which is particularly thick and sticky and used in the main engine of the vessel. Then we can have Diesel Oil (also called Marine Gas Oil) which is used when the vessels do manoeuvres in the ports or Low Sulphur Fuel Oil (LSFO). These fuels, issued from the crude oil distillation process, once they are combusted produce high quantities of CO<sub>2</sub> emissions, are extremely polluting and therefore play a large part in contributing to the ongoing climate change.

The greenhouse gas (GHG) emissions – including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), expressed in CO<sub>2</sub>e – of total shipping (international, domestic and fishing) have increased from 977 million tonnes in 2012 to 1,076 million tonnes in 2018 (9.6% increase). In 2012, 962 million tonnes were CO<sub>2</sub> emissions, while in 2018 this amount grew 9.3% to 1,056 million tonnes of CO<sub>2</sub> emissions (Fourth IMO GHG Study 2020)

One way to address this was the prohibition by the IMO of the use of HFO in the Arctic region (some special ships such as ships used for the safety of other ships) as of 1st July 2024 to limit the damages. One should also not overlook the fact that an old vessel with propulsion systems that were installed more than 20 years ago will not help the vessel in terms of energy efficiency. According to the Baltic Exchange, a Capesize vessel burns around 44 tonnes of bunker fuel per day if it navigates at 12 knots (approx. 22km/h) laden (with cargo) and 13 knots (approx. 24 km/h) ballast. This amount varies according to the size of the vessel and its speed, which can vary from normal, low steaming, extra low steaming, and minimal cost. The new technological advances in this area have also enabled the vessels to use less fuel for the same journey.

In 2020, the IMO, International Maritime Organisation, introduced a new regulation limiting the sulphur content of maritime fuel oil to a maximum level of 0.050% mass by mass, a massive reduction from the previous 3.5% to follow the guidelines for ecological efficiency and environmental preservation. In certain regions of the globe (called emission control areas “ECAS”), even more restrictive amounts are imposed. For instance, in the Baltic Sea area, the limit is only 0.10% mass by mass. Indeed, sulphur fumes from ships are in the form of sulphur oxide (SO<sub>2</sub>), a mix between sulphur and oxygen atoms that is extremely harmful to the environment and population. These gases can create severe respiratory diseases and once mixed with the air can transform into acid rain damaging agriculture, forests and increasing the acidification of the oceans, which subsequently leads to a disruption of the marine ecosystem. To comply with this new regulation, many ships and shipowners have decided to replace the fuels used with some that are less polluting and contain less sulphur or to install scrubbers, which are gas exhaust cleaning systems reducing the engines’ sulphur emissions. An interesting report was issued by Royal Academy of Engineering a few years ago in July 2013 entitled “Future Ship Powering Options - Exploring alternative methods of ship propulsion” The president of this entity detailed the shipping sector as following:

Shipping is vital to the world economy. It is a critical part of international import and export markets and supports the global distribution of goods. As

for all industries, concerns about climate change require the reduction of greenhouse gas emissions from the shipping sector. This entails higher fuel prices for low sulphur fuels. It means that the industry must prepare for the new future and investigate alternative, more economic ship propulsion systems. (Sir John Parker GBE FREng, 2013)

This report explains in detail the different opportunities that exist in 3 time periods (short-, medium- and long-term) and provides us with a clear explanation of the advantages and disadvantages of different fuel types such as diesel, Liquid Natural Gas (LNG), nuclear power, biofuels, superconducting electric motors, or hydrogen.

The new IMO regulation has also given more importance to thinking about alternatives to fossil fuels, methods that would be less damaging to the environment and that would move towards a decarbonisation of this sector, such as the use of ships running on hydrogen, ammonia, LNG, Biofuel or even ideas that, as yet, are hardly used in this sector such as solar energy. Biofuel is a good climate neutral candidate as the plants which will be later used as components for biofuel capture carbon dioxide in their growing process. Hydrogen and ammonia are not emitters of such molecules as they do not contain any carbon molecule in their composition and therefore are considered as zero carbon fuels. However, it is important to be aware that to date it is difficult to find a fuel that can 100% replace bunker fuel in maritime transport. It will therefore be necessary to decarbonise this sector by using a mix of several of the aforementioned components to achieve this, ships that have the possibility of using two types of fuel will have an advantage over those using only one type of fuel. An alternative that is becoming more and more important and is also gaining interest as technology advances is the use of wind-powered vessels. It is quite surprising and interesting to return to an energy that has as its basis something very simple and that was already used at the beginning of the maritime era at the time of Greek maritime power and the discoveries of the world by Vasco de Gama and other adventurers. A riveting article entitled “Owner drawn to wind-assist technology amid high fuel prices” was published by Lloyd’s List on 19th July 2022 regarding this alternative and the increasing interest in it. Around 20 commercial vessels are currently using this type of renewable energy and as per

the article, we expect the number to increase to 100 by 2025. Regarding other alternative fuels, the International Chamber of Shipping (ICS), which is an organisation representing the world's national shipowner associations and approximately 80% of the world merchant fleet, issued in March 2022 a report called "Fuelling the Fourth Propulsion Revolution: An Opportunity for All". The organisation summarised its report as following:

Decarbonisation and the creation of (net) zero carbon fuel presents a significant economic opportunity for shipowners, companies and countries, as fuel producers, importers and exporters. This report presents new research that demonstrates how shipping will play a fundamental role in delivering these fuels globally and act as an enabler for governments and industries to achieve their climate targets. (International Chamber of Shipping, 2022)

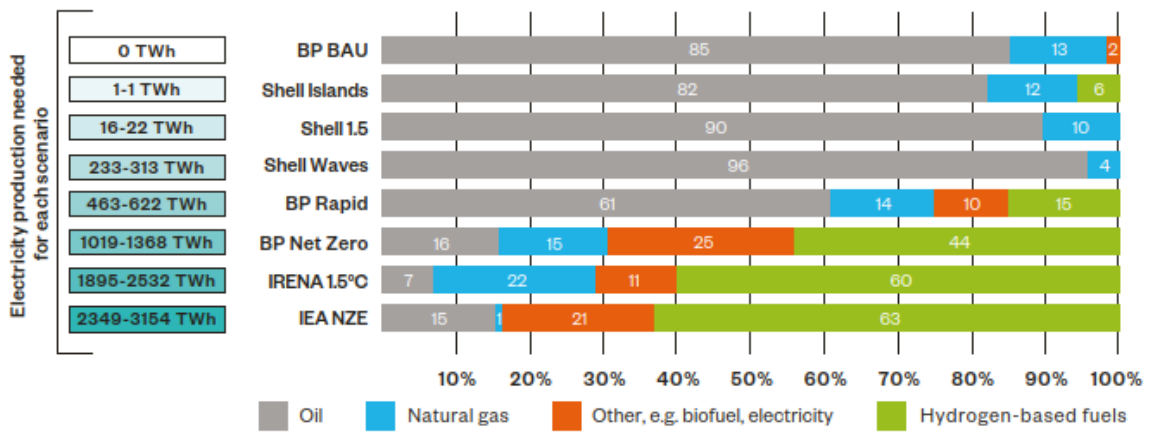
Indeed, the marine industry will be a major player in reducing global emissions in future years and it is important that all market players invest time and capital in maritime research and developments to achieve net-zero carbon dioxide emissions by 2050. We can read the following statement in the report:

The scale and challenge to supply alternative fuels to decarbonise the shipping sector is often underestimated. To supply shipping's (net) zero carbon fuel needs (as outlined in International Energy Agency and IRENA scenarios), electricity from renewable sources used to supply shipping would need to increase by up to 3,000 TWh considering expected technology efficiencies by 2050. This could require the equivalent of all of the world's current renewable energy production just to provide shipping's fuel needs. (International Chamber of Shipping, 2022)

This confirms the complexity of the decarbonisation process for this industry. Given the magnitude that the market has achieved over the decades, it is important to

move forward step by step and the European Union is trying to do this with the inclusion of shipping in the ETS but also through its various environmental projects which have as their objectives those set out in the “Fit for 55” package. It will be important in the future to link all projects together, both those carried out in the European Union and those carried out abroad.

**Table 1 Various scenarios of fuel mixes for maritime shipping in 2050**



Source: ICS, *Fuelling the Fourth Propulsion Revolution: An Opportunity for All*, 2022, p.36

Inside the International Maritime Organisation there is a specific committee in charge of marine environment protection. In 2018, they initiated their main strategy to reduce the greenhouse gas emissions from ships and in June 2021, they adopted new changes to the International Convention for the Prevention of Pollution from Ships (MARPOL) regarding further reduction in greenhouse gas emissions. The new measures will require the following:

The new measures will require all ships to calculate their Energy Efficiency Existing Ship Index (EEXI) following technical means to improve their energy efficiency and to establish their annual operational carbon intensity indicator (CCI) and CII rating. Carbon intensity links the GHG emissions to the transport work of ships. The attained Energy Efficiency Existing Ship Index (EEXI) is required to be calculated for ships of 400 gt and above, in accordance with the different values set for ship types and size categories. (MARPOL, 2021)

Regarding the Carbon intensity indicator (CII) the IMO presents the following procedure:

The amendments apply to ships of 5'000 gross tonnage and above (the ships already subject to the requirement for data collection system for fuel oil consumption of ships). These ships are required to have determined their required annual operational carbon intensity indicator (CII). Ships will get a rating of their efficiency (A,B,C,D,E - where A is the best), which will be incorporated in their mandatory Statement of Compliance to be issued by the Administration. Administrations, port authorities and other stakeholders as appropriate are also encouraged to provide incentives to ships rated as A or B. (MARPOL, 2021)

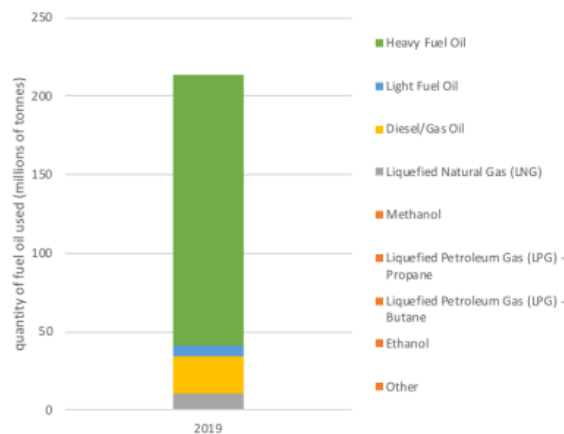
The newly accepted changes should be applied as of 1st November 2022 and on 1st January 2023 for the EEXI and CII requirements. These various regulations show that organisations are striving to put in place restrictions and limits on greenhouse gases that are very harmful to the environment. The question now is whether these regulations are tight enough to see a net reduction in greenhouse gases or not. Many changes, perhaps even more restrictive and severe, are still needed if we are to meet the targets set in the Paris agreements. The IMO strategy (from 2011 to 2050 onwards) can be found in *Appendix A*.

The Secretary General of the IMO, Mr. Kitack Lim commented on this in the Fourth IMO GHG Study published in 2020:

The path to decarbonization is a long, but also a common path in which we need to consider and respect each other's views. We have made a considerable amount of progress since the start of our journey. Agreement on the work plan sends the signal that the Organisation and its Member States are ready to further consider the current and future proposals for mid-

term measures. We need to gear up work relating to the various phases of the work plan in order to give efficient and adequate consideration to concrete proposals for the reduction of greenhouse gases in keeping with our goals in the initial strategy. Let us continue to work together on the tasks you have in front of you as we continue to make progress on this common path. (Kitack, 2020)

There is indeed a long way to go, but we must force ourselves to act now, because according to some people, actions are taken far too late.



**Fig. 4 The aggregate annual amount of each type of fuel oil consumed by all ships of 5'000 GT and above**

Source: AIR POLLUTION AND ENERGY EFFICIENCY (imo.org)

The above graph represents the fuel category used by the vessels above 5'000GT which fall under scope of the MARPOL regulations. This shows us that in 2019, a lot of vessels were still using Heavy Fuel Oil and not yet many other alternatives. But it is important to keep in mind that building new vessels takes a lot of time and changing a propulsion system is not as simple and quick as that. Even if new ships exist today, others are still in the construction phase and will be operational in a year or more.

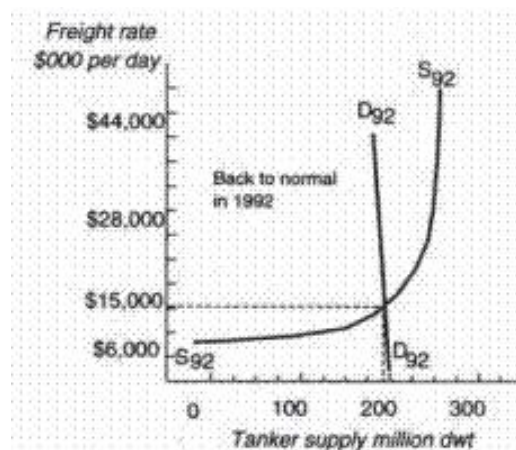
In this thesis project we will mainly focus on the business of shipowners and how their business evolved through the years and analyse the impact of new regulations regarding carbon emissions on the financial part of these companies, more

specifically on the changes that will be required in the risk management of freight rates to remain as competitive as possible to remain among the best in future years. To begin our analysis of the freight market, it is important to present the basics of this market, on what model it is based and how we can interact with it to get the best out of it. We will base ourselves on the same method as the one presented by Martin Stopford in his book Maritime Economics, namely a simple method of supply and demand which are linked together by the freight market, which balances the two sides and presents a price. Demand and supply can be impacted by many factors, and it would take too long to take them all into account to explain this pattern. Therefore, we decided to select the factors that seem to us the most important and logical. For example, for demand, the general state of the world economy, transport costs, the average distance travelled by ships (also called average haul) and unexpected demand shocks (that usually generate extreme market instability) seem to us to be a good guess. On the supply side, the amount of operating fleet, their productivity, the level of shipbuilding projects, the scrapping of ships and the freight revenue will be included in our explanation (Stopford, 2020). We will again have a balance between actors of the market which will react differently to shocks that appear on demand and/or supply. On one side we have the companies that need to transport their goods around the world, usually large companies trading commodities or manufacturers but also other players such as traders and operators searching for the best opportunity, to maximise their Profit and Loss (PnL), to transport their products from point A to point B. As previously explained in the shipping cycles mechanism, for the demand we have impacts that are more short-term related and which react to a certain event, or due to the seasonality of the commodity traded, and on the other side we have the long-term perspective, which relates more to the technological advances and the major changes in the economical scheme that would require longer to be implemented but which have a significant effect on the demand. Then, on the supply side we have the shipowners or large companies that have their own fleet who will offer their services and vessels to meet the market demand. Finally, to link the demand with the supply we have the freight market that is used. It provides the daily rates and adjusts them throughout the day/week. For instance, if a shock on the supply side occurs, the rates will move up in consequence. The shipowners will receive more for the services they provide and on the demand side, the players will search for alternative methods to transport their goods and protect them from rising prices, such as, buying older ships on the

second-hand market. However, it is important to keep in mind that demand is much more mercurial than supply. As for the supply, it is balanced a little less quickly, mainly because the construction of new vessels takes between 18 months and 3 years to be finalised and so the supply is usually incapable of reacting immediately to a surge or drop in demand. The Covid-19 crisis is typically an event that influenced both the demand and the supply. As most of the world economy was put to a halt, and most industries had to shut down their production, demand for raw materials decreased drastically. As demand declined, the suppliers tried to store their goods either in their storage location on ground or to use vessels. This led to a significant increase of inventory but also to a number of other issues due to the duration of the pandemic. Storage locations experienced no turnover, thus creating huge storage challenges for suppliers for whom production was difficult to halt due to technical reasons. On the other hand, as lockdowns were announced, most of the ports had to reduce their activities due to a lack of staff, which created port congestion and therefore a disruption in the supply chain and a reduction of the fleet performance. The bulk market, which is the one related to our thesis project, surged similarly to the container market due to the Covid-19 pandemic. It suffered also from port congestion due to reduced efficiency in the discharge and loading of bulk commodities as stricter Covid-19 restrictions induced less employees for those services. In 2021 the sector experienced a return of demand which turned out to be stronger than expected due to a rapid recovery from the Covid-19 crisis. Even though we had not yet fully recovered from this health crisis, we were already feeling a clear upturn. Dry bulk recorded freight rates rarely reached before and high market volatility has been possible thanks to the imbalance between supply and demand. However, this should stabilise in the years to come if we do not experience another major shock. As shipowners look ahead to the inclusion of the shipping sector into the EU ETS and potential new IMO regulations, experts estimate that the percentage of new ships launched in 2022 will be 2% compared to 4% in 2021 (S&P Global Commodity Insight, 2021). As Capesize vessels and Panamax vessels transport most of the iron ore and coal, the bulk sector will be highly impacted by shortages and shocks in those respective commodity markets. China is the biggest importer of iron ore and coal which has its main source in Australia and Brazil for iron ore and Indonesia for coal. China has a very strict health policy, and it is not surprising that lockdowns and restrictions on activities will continue for some years.

But it will have to import raw materials anyway given its enormous consumption of these raw materials.

As previously explained the freight market is the link between the demand and the supply and its mechanism is quite straightforward; the shipowners and the ship investors negotiate to settle a freight rate which reflects as closely as possible to the number of active vessels in the market. The rates will be low when the number of vessels is high and vice-versa. To explain how the freight rates are created, we will use the perfect competition model and the supply and demand function, same approach as Martin Stopford in his book Maritime Economics. For the supply side, the shipowner won't offer his vessel at any price, if the freight rate goes under the breakeven value (which differs for each vessel size), he won't offer any service to economise on fuel costs. As soon as the rates increase the shipowner will use his vessel and will decide at which speed the vessel will operate, again to maximise the fuel costs (the best situation for the shipowner is when the marginal cost of 1 supplementary ton mile of transport equals the freight rate). Altogether, the supply function will construct itself in a "J-shaped" curve as presented below.



**Fig. 5 Supply curve, Martin Stopford, Maritime Economics, 3rd edition**

Of course, the supply side is not only affected by the speed of a vessel but also the age of the vessel, the storage costs etc... The demand function on the other hand is much more inelastic and therefore the curve has a much more vertical aspect. As there is no real threat from another market, and the customers need to transport their goods from point A to B, in the short term they have no various alternatives and must "accept" the price as it is. In the long run shipowners will be able to put

their ships into the scraping market and remove them completely from the shipping market or invest in new ships and therefore affect the supply. As for any market the equilibrium is then reached when the demand meets the supply. However, this view is only theoretical and in the actual market, much more external influences such as economical disruptions, market sentiment, political turmoil as we experience nowadays with the war between Ukraine and Russia and the sanctions that might be applied to the commodity market, crises such as the Covid-19 pandemic that altogether put pressure on the freight rates.

As for every market, risks are involved in the transactions and can be borne by either by both parties or only by one. Several options are available for each counterparty to hinder losses and protect himself from any unexpected impact that those risks can create. In the shipping market, shipowners and cargo shippers can use the freight derivatives market to hedge their positions. Simply put, a derivative is a financial instrument whose value is derived from an underlying asset, for instance in the shipping market the underlying could be the future freight rates. Shipowners and their customers will create a derivative contract, based on FFA's which are Forward Freight Agreements which stipulate the freight rate used, at which quantity, and by the choice of any of the major shipping routes in the market (dry or tanker) at a future time "T". The basic concept is that you usually enter into a derivative method that goes the opposite way of the spot market agreement you concluded to hedge yourself in case the market goes the opposite way than was initially calculated/estimated to hinder losses in your PnL. For instance, a shipowner can sell, and therefore have a short position, on a freight forward contract if he thinks that the market is on a declining trend to protect himself from decreasing prices. On the other hand, if the prices are moving upwards, in a bullish market, a charterer will be interested to settle a long position, hence buy a freight forward contract to insure a buying price. Those freight derivatives are constructed on indexes which mirror the risks that will be hedged. The most common index is the Baltic Exchange, created in 1985. The primary index, called Baltic Freight Index (BFI) was split into four different indexes, each representative of a specific route: the Baltic Exchange Capesize Index (BCI), the Baltic Exchange Panamax Index (BPI), the Baltic Exchange Handymax Index (BHMI) and the Baltic Exchange Dry Index (BDI). Nowadays, the freight derivatives are mostly traded through the FFA's which are

principal to principal swap contracts mostly regulated by a broker (but also possible through electronic transactions) and later through a clearing broker once the settlement has been agreed by both parties. This system mechanism is efficient but faces transparency issues as the contract, as mentioned above, is discussed between two parties and at the end by a broker. Moreover, this market is also open for other investors which do not have a direct link with the market but use it as speculation on the future evolution of the market. This creates additional volatility and biases the market.

Until 20 years ago, protecting oneself from freight risk by using derivatives was not a common thing and was not necessarily used by commodity trading companies in their day-to-day trading activities. Some trading firms/shipping companies used futures contracts such as the BIFFEX (Baltic International Freight Futures Exchange) to perform their hedge, but their positions were not the most precise and sometimes they were too much exposed in the market. However, in recent years, it has become possible to trade freight as a commodity such as grains or oil, which has greatly increased the interest of shipping companies, but not only because many other players in the market such as traders, financing banks, hedge funds and others are becoming more and more interested to use freight derivatives as an alternative to other hedging tools to mitigate the overall exposure on the physical market. Our aim in writing this thesis is to analyse the methods that companies have at their disposal in terms of risk management, focusing on the use of FFAs and the impact of new regulations that will come into force on carbon emissions in 2023 in this specific shipping market. First, we will briefly explain the types of risks that a shipping company faces in its day-to-day business, how it can manage this risk effectively to maintain or increase performance and how it can protect itself, or hedge its positions, by using the derivative market. Then, we will link this analysis to the new regulations established by the European Commission regarding carbon emissions in the shipping market, what are the key points to remember and how they will impact the trading system of these shipping companies.

As for an active company in a market, one of the major risks is the price risk. This risk is present since it is extremely difficult and challenging to predict futures prices and how they will evolve in the short or long run. Therefore, there is always a part

of uncertainty that needs to be considered in company's decisions to hinder a loss on their PnL if their predictions differ from the market reality. This volatility in price movements is an example of price risk. Another type of risk that should not be set aside is the financial risk, the risk that a company has liquidity problems. For shipping companies, if we detail a little further the price risk, we will certainly consider the risk that the freight market rates will evolve and that the risk of price movements will affect the financial performance of the company. When a risk manager performs an analysis on the current risk of the company, he should certainly include the volatility expectations of the different operating risks such as bunker fuel prices volatility, vessels maintenance costs, loans expenses if the fleet was acquired through a debt mechanism (which usually is the case as the market require huge capital inputs) but also not forget about the market risks and basis risk (risk that futures prices deviate from expectations and therefore create a uncovered part for your position, if the company decides to hedge) and that might affect the company in the future. Another important risk that should not be forgotten when analysing the current risk exposure is the credit risk. As, the FFAs are generally traded over the counter (OTC) (or through Clearing Houses such as the London Clearing House (LCH.Clearnet) or the New York Mecantile Exchange (NYMEX)), by using OTC there is a risk that the other participant fails to honour his obligations and therefore creates a loss for the remaining party. However, there are financial instruments to mitigate this specific risk for instance by using a letter of credit or bank guarantee or using one of the aforementioned clearing houses

The forward contracts in shipping, called FFAs, and which we presented earlier are priced differently than a normal forward contract in other types of commodities in which the price includes items such as cost of financing, carrying costs and a convenience yield. Amir H. Alizadeh and Nikos K. Nomikos presented in their book "Shipping Derivatives and Risk Management" the mathematical formula for FFAs, as following

$$F(t,T) = E(ST|T)$$

With  $E (.|.)$  the mathematical conditional expectations at time  $T_t$  and  $\Omega_t$  is the information set available to market participants at the same time conditional

on which the expectation is computed. This equation states that the price today of a future contract for delivery at time T equals the spot price that the market agents expect to prevail at maturity. FFAs are settled in cash on the difference between the contract price and an appropriate settlement price. FFA rates trade the expected value of the service of seaborne transportation, which is not practical to store or carry forward in time. As a result, FFA rates and the underlying spot rates are not linked through arbitrage, but are driven by the expectations of market agents, regarding the spot prices that will prevail at the expiry of the contract. (Shipping Derivatives and Risk Management, Amir H. Alizadeh and Nikos K. Nomikos, p.19-20)

As shipowners would like to protect themselves from a decline in freight rates (which would reduce their income on the transaction), they will usually enter the derivative market with a short position (and sell the hedge). As part of our analysis on the risk management tools in chapter three and four, we focus on hedging mechanisms using time-charter rate for Capesize and Panamax vessels extracted from the Baltic Exchange, respectively Capesize 5TC and Panamax 4TC rates. The rates description can be found in chapter 3, see *Table 7* and *Table 8*. Our interest is to understand the potential impact the EU ETS inclusion of the shipping market as of 2023 might have on the freight rates mentioned above. Risk management is important in such a market, which naturally has significant volatility and thus it's important that the market players (shipowners, financial institutions, etc...) protect their portfolio with hedging tools. We decided to analyse the shipowner side, and therefore are interested in the mechanism of selling futures contracts in the market, as this is the risk management tool shipowners have at their disposal if they believe that freight rates will lose value in the coming months. What is advantageous for some investors is that it is a market in which physical delivery does not exist because it is only settled transactions in cash between the different stakeholders.

Now that we have established the basics of the shipping market and risk management, particularly the system of FFA hedging, we would like to continue our

analysis on a very topical and contentious subject which is the decarbonization of the shipping sector. Even if some remain climate sceptics, the figures do not deceive, and we are indeed in a global climate crisis. Global warming is here to stay, and we must direct all our efforts to reduce our carbon emissions as much as possible, such as by putting a price on the carbon emission, if we are to meet the targets set by governments, for instance the Paris Agreement accepted by 196 parties in 2015, and the IMO up to 2050 and of course for the years beyond. And as shipping accounts for around 3% of the global emissions and as around 90% of the products are transported by sea, it is certainly an important topic to be considered in our environmental friendlier actions towards a smooth and greener energy transition. An important legislative, part of the European Green Deal, that was implemented and represents one of the pillars for the European ecological transition is the “Fit for 55” plan. Its main aim is to modify the current EU legislation and add new ones to

Ensure a just and socially fair transition maintain and strengthen innovation and competitiveness of EU industry while ensuring a level playing field vis-à-vis third country economic operators and underpin the EU's position as leading the way in the global fight against climate change.  
(European Green Deal)

Part of the Fit for 55 package is related to the EU emission trading system and we will focus our analysis on this system and more precisely the inclusion as of 2023 (and implemented over a 3-year period) of the shipping market and its impact on shipowners' risk management. The EU ETS is the biggest carbon market and was created to achieve a global greenhouse gas emission reduction. In 2005, the European Union Commission imposed a cap-and-trade system restraining the number of emissions companies can emit during a year. The system works on a basic mechanism of using carbon allowances (permit to cover 1 ton of CO<sub>2</sub> emitted) and trading them on the market between the companies (producers, power companies and airlines) that need additional allowances because the fixed amount they have is not sufficient and the ones that have enough and are able to sell them. Over the years, the fixed cap was decreased to ensure that the companies make

significant changes in their structure to curb the emissions. Introducing the shipping market into the European Emission Trading System has as objective also to enhance the awareness of climate change and to encourage companies to move towards a greener, more nature-friendly system by impacting the price of freight. This will hopefully lead to more technological innovations from shipbuilders, ships that will evolve with renewable energies. Recent articles published on the Lloyd's List website, the reference in maritime information, existing since 1734 and created by Edward Lloyd, confirms this view. Many shipowners are thinking about alternatives to fossil fuels and some, such as Maersk, have decided to try their hand at biofuels, a raw material that is becoming more and more important in our daily lives. According to an article of the Maritime Executive, a maritime news platform, some expansion plans on the biodiesel market are being launched in the world and one specifically in Amsterdam to support the use of this alternative in the future for maritime and road transport. Maersk, one of the biggest shipping companies in the world, made significant changes in its strategy. In addition to its biofuel project, it has also announced a major project to promote the use of methanol as a fuel in new container ships that will sail in the Baltic region. Moreover, advances in technologies in the future could see the rise of green and blue hydrogen and ammonia as efficient alternatives. In addition to the new regulation involving the European Trading System, since 2015 the European Union has been taking measures to achieve its future objectives. It has introduced the MRV Regulation which requires all owners of ships over 5000 gross tonnage (whether passenger or cargo) to submit monitoring and carbon dioxide emissions data from their voyages by August 2017. But, although all these initiatives and new regulations have clear and plausible objectives, many criticisms from NGOs fighting for the environment and against global warming have been voiced. Indeed, reducing emissions from such a sector takes time and critics mention that these regulations should have been taken much earlier. Mr. Antonio Guterres, Secretary General of the United Nations, also spoke out during the UN Global Sustainable Transport Conference in Beijing in October 2021 and criticised the IMO for not following the same line as the 2015 Paris Agreement 1.5-degree Celsius targets but also for the dithering of its decisions.

Regarding the announcement from the European Commission in July 2021 to introduce the shipping market into the European Union Emission Trading System to

increase decarbonization, several questions arose such as who will be the party responsible for paying the carbon tax in the system? As per the shipping association Baltic and International Maritime Council, BIMCO, they stated in their update greenhouse gas position statement that “in the case of a time charterparty, this responsibility should lie with the charterer, and under a voyage charterparty, it should be with the party that commits the ship to the voyage charter” (BIMCO, 2022). The emissions that will be considered are the ones from voyages occurring inside European borders and all emissions when the vessel has been moored in a European port. If the voyage implies an international port (as destination or incoming from), 50% of the emissions will be in scope regarding the Fit for 55 package.

The European Parliament conference in June 2022 enabled the project to move forward. Important votes were discussed and amendments were made to the legal document “Proposal for a directive of the European Parliament and of the Council amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757 (COM(2021)0551-C9-0318/2021-2021/0211(CODD))” such as the scope of vessels included in the package. Indeed, the “Proposal for a directive Recital 15” was amended and they added the following measure to the text proposed by the Commission.

In order to increase the environmental effectiveness of Union measures and avoid unfair competition and incentives for circumvention, the scope of Regulation (EU) 2015/757 should be amended to cover ships of 400 gross tonnage and above from 1 January 2024. In order to ensure there is a proportionate administrative burden, for ships of less than 5000 gross tonnage, operators should only be required to report the information which is relevant for inclusion from 1 January 2027 of such ships within the scope of EU ETS, in particular the type of fuel, its carbon factor and energy density. (European Commission, 2022)

For instance, a shipping company which would fail to cede enough allowances by 30th April each year could incur important financial penalties. These penalties should be calculated at 100€ per ton of CO2 emitted for the failing allowances.

Moreover, they amended the “Proposal for a directive Recital 17”, mentioning that the shipping companies will be asked to surrender their allowances (the number is based on the total of the emissions from the preceding year) as of 2024. Then, as of 2027 the program will be extended to all ships wishing to enter or leave a European port with the exception of specific vessels such as ice-class ships which decarbonisation schedule is delayed, they added the following comments:

The extension of the EU ETS to the maritime transport sector should thus include emissions from voyages to and from third countries, while providing for derogations in relation to half of the emissions from ships performing voyages arriving at a port under the jurisdiction of a Member State from a port outside the jurisdiction of a Member State, half of the emissions from ships performing voyages departing from a port under jurisdiction of a Member State and arriving at a port outside the jurisdiction of a Member State under strict conditions, in particular where a third country has a carbon pricing mechanism in place, or has established through a bilateral or multilateral agreement between the Union and one or more third countries a carbon pricing mechanism linked to the EU ETS, pursuant to Article 25 of Directive 2003/87/EC, to cap and reduce emissions to a level at least equivalent to the EU ETS, meaning a binding mechanism to cap, reduce and price maritime greenhouse gas emissions, resulting in an absolute emissions reduction at least equivalent to the case where 100% of those emissions would be subject to the EU ETS or where a third country is a Least Developed Country or Small Island Developing State that has a GDP per capita not equalling or exceeding the Union average and includes such emissions under its nationally

determined contributions under the Paris Agreement. (European Commission, 2022)

But it was also detailed that if the IMO measures are insufficient to meet the Paris Agreement, then the European Union will have to impose its measures on all emissions from ships travelling to or from a member state.

An important amendment was made to the “Recital 20” regarding the compliance responsibility of each actor in the shipping market regarding fuel costs. Firstly, the proposal was meant to be addressed to the shipping company, responsible for the operation of a ship. However, they decided to amend this and add the following:

However, the shipping company is not always responsible for purchasing the fuel or taking operational decisions that affect the greenhouse gas emissions of the ship. Those responsibilities can be assumed by an entity other than the shipping company under a contractual arrangement. In that case, in order to ensure that the polluter pays principle is fully respected and to encourage the adoption of efficiency measures and cleaner fuels, a binding clause should be included in such arrangements for the purpose of passing the costs so that the entity that is ultimately responsible for the decisions affecting the greenhouse gas emissions of the ship is held accountable for covering the compliance costs paid by the shipping company under this Directive. (European Commission, 2022)

Furthermore, The European Council and the European Parliament came to a decision that 75% of the revenues generated from the auctioning of the carbon allowances will be transferred to an Ocean Fund as a financial contribution which will help improve the technologies and infrastructures and ease the decarbonisation of this sector. However, the story does not end here. Indeed, at its conference in June 2022, the European Parliament did not accept the carbon report discussed earlier, to the surprise of the shipowners, who thought that they were supported by the environmental committee. The final draft of the inclusion of shipping in the ETS

scheme will therefore have to be reviewed at another conference, and according to some experts a decision could already be taken in July, but most believe that no clear decision will be taken before the autumn meeting. One of the key proposals, and the one that has caused the most concern to date, is that of responsibility for paying the carbon allowances. If no change is made, the regulation will apply the polluter principle and it will be the charterers and therefore the voyage operators who will be required to pay this tax.

Some critics and comments rose after the announcement of the inclusion of the shipping market into the EU ETS, for example a comment that came back often is the negative and more intense impact of these new regulations on small shipping firms that experience more difficulties in accessing the carbon trading market, in hedging their risks but also in financing themselves. These would therefore be far more disadvantaged compared to the other market giants and would risk losing their competitive advantage once the inclusion is finalised.

The impact of the introduction of the maritime transport sector into the ETS has an impact not only on the decarbonisation of ships and the future of this still over-polluting sector, but it also has an economic and macroeconomic impact. Indeed, this introduction will imply additional costs for shipowners, charterers etc. in the form of carbon tax payments, astronomical costs to modify ship propulsion systems and/or expenditure on research and development to enable the construction of greener ships that operate on renewable energy. Moreover, to comply with the regulations, the companies will have to adapt their legal system and will also need to increase administrative work to be in line with the market needs and obligations. The European Commission issued a report entitled “Study on EU ETS for maritime transport and possible alternative options of combinations to reduce greenhouse gas emissions”, published in October 2021, and which is a reliable and very detailed report on the possible impacts of the EU ETS introduction on the maritime sector. As per this report, the macroeconomic- impacts are less blatant than in other legislative implementations and will not involve a drastic shock to the markets.

The direct change in ship running costs resulting from the application of carbon pricing measure would be expected in turn to impact on freight rates, depending on the ability to pass these additional costs or savings through the

maritime supply chain. In general, this would only marginally increase the import prices of goods, as transport cost generally represent a small share of commodity prices. Only heavy, low-value commodities may be associated with sizeable increases in import prices. An analysis of the impacts on import prices and demand for selected commodities suggests that, even in the case of full pass-through, price increases are expected to range between 0% to 0.7% in 2030 and grow up to 2% in 2050. The effects on demand will vary from commodity to commodity but are expected to be minor overall. (European Commission, 2021)

It is true that the shipping sector evolves differently from other financial markets, as the transport part is less important in the formation of commodity prices.

Regarding the practical process inside the EU ETS for the auction of allowances of maritime emissions, two possible systems are under discussion. The first one would be a system where the totality of the allowances are auctioned. This system is already used for most of the allowances inside the EU ETS since the 3rd phase. Every year, the market players were receiving less allowances and had to obtain the remaining needed through the auctioned market. The advantage of this method is that the traceability of the allowance will be easier and more effective. Moreover, the polluter pays principle that seems to be the system that will be accepted in the next official meeting could easily be applied. The second option is a multiple system, a mix of auctioned and free given allowances. The European Commission detailed this option in their report “Study on EU ETS for maritime transport and possible alternative options of combinations to reduce greenhouse gas emissions” as following:

In the EU ETS, free allocation is currently being used as a way to address the risk of carbon leakage and is based on benchmarking which suggests that only the most efficient installations can cover all their emissions with free allowances. In the maritime sector, this can in theory apply to those cases where the ETS price would force a shift

of certain shipping streams from maritime to, for example, road transport. However, it should be noted that the maritime sector is distinct from stationary emission sectors in EU ETS as the flag neutrality principle would already virtually eliminate the risk of competitive distortion between ships/companies and therefore no free allowance allocation would be needed to safeguard a level playing field. At the same time, the mixed approach combining auctioning and free allocation can also be used as part of a transitional approach which would give regulated entities time to adapt their processes and investment strategies to include the carbon price in their decisions. (European Commission, 2021)

We will see in the coming months which method will be the final one accepted by the European Union for the inclusion of maritime transport in the EU ETS.

**Table 2 Comparison of allowances allocation options**

Possible variation for allocation of allowances	Full auctioning	Auctioning + free allocation at fixed percentage based on benchmarks (transitional measure)
Pros	<ul style="list-style-type: none"> <li>• Strong price incentive from the outset</li> <li>• No need to calculate free allocation levels</li> <li>• Generates more revenue which can be recycled</li> </ul>	<ul style="list-style-type: none"> <li>• Allows for adjustment to EU ETS for shipping sector</li> <li>• Likely to generate higher level of acceptance among key stakeholders</li> </ul>
Cons	<ul style="list-style-type: none"> <li>• High pressure of companies without a transition period to adjust</li> </ul>	<ul style="list-style-type: none"> <li>• Against EU ETS objective of moving to full auctioning for all sectors not at risk of carbon leakage</li> </ul>
Other elements to be determined	<ul style="list-style-type: none"> <li>• N/A</li> </ul>	<ul style="list-style-type: none"> <li>• Lower price signal at the start</li> <li>• Benchmarks and level of free allocation to be determined</li> </ul>

Source: European Commission, Study on EU ETS for maritime transport and possible alternative options of combustions to reduce greenhouse gas emissions, 2021, p.44

If the European Union decides to apply the polluter principle, as mentioned earlier, this will mean that charterers would be responsible for paying the carbon tax. This system will therefore have a similarity to the power market where the product is sold several years in advance and the carbon price is not necessarily known at the time of contract acceptance.

If regulated entities in the maritime sector decide to pass on the ETS costs to charterers or cargo owners (should these be different entities), their situation would be comparable to that of power producers which sell electricity for several years ahead when the EU ETS price is not yet known. To address the risks associated with these sales, they typically hedge carbon prices by purchasing allowances to cover their emissions in future periods. Shipowners would be able to deploy a similar strategy which would reduce the risks they are facing but in turn may have a strong impact on the allowance demand. The extent of the impact of possible hedging on the allowance demand will also depend on the proportion of freely allocated versus auctioned allowances, but given that there will be a need for hedging upon the launch of the ETS regulation, the demand for allowances in early periods would likely exceed the allowances required to cover the emissions in the first year. A similar approach is applied to address the risks associated with fuel price fluctuations which is currently done via fuel hedging. Alternatively, shipowners may decide to charge charterers the emission cost based on the latest ETS prices (likely with addition of a risk premium). This approach may be undertaken by shipowners without access to the necessary financial resources to facilitate hedging (potentially, smaller ship owning companies). However, given the dynamic ETS market, this approach is likely to result in windfall profits for shipowners when the prices are going down and produce extra costs when they are on the rise. To deal with this uncertainty, companies may respond by introducing surcharges within the charter contracts to compensate for fluctuations around ETS payments. These surcharges may be similar to the Bunker Adjustment Factor (BAF), which is levied on ship operators in response to fuel price volatility caused by recent

IMO regulations (e.g. low-sulphur fuels regulation). However, with the strong competition in the sector, introducing these charges may be challenging. Given that this approach provides little certainty for both shipowners and charterers, its application is less likely. A company could also decide to charge emission related costs at the end of the contract when a charterer reports emissions from its operations, or to request the charterer to directly purchase allowances and transfer them to the shipowner which will then surrender them to the regulator. (European Commission, 2021)

This explanation shows us the different opportunities that will exist to impose the cost of carbon on charterers. At this point, it is still difficult to demonstrate with certainty which method will be applied by the market players. Moreover, as of today, the allowances amount that will be distributed to the related parties has not yet been decided. This will be a major part for the shipowners and/or charterers that will afterwards use the EUA Carbon market to resale their allowances if they have some left or buying other allowances if the amount provided isn't sufficient regarding their emission scheme.

For a shipowner, the EU ETS market will allow him to buy and/or sell carbon credit. The product we are interested in in this thesis project is the European Emissions Allowances (EUAs), which are the products traded via the compliance market. In addition, a shipowner can also buy or sell a product called offset, which is traded in the voluntary market, but will not dwell on this specificity of the market for our project because the two products are different, and the actors cannot be used in place of the EUAs. To illustrate this theoretical part, we will construct a hypothetical example of carbon credit trading. In the carbon market, each polluter receives a certain amount of EUA. If the polluter needs additional allowances, he can decide to buy them on the market. On the other hand, depending on its pollution, it could also sell the excess emissions it has. We assume in our example that the allowances received by the shipowner are not sufficient and he has to resort to the ICE (Intercontinental Exchange) market, to which he has gained access, to buy and/or resell carbon credits. It is vital that the shipowner is able to establish a budget for trading on the ICE market because although he may want to be able to resell at a

better price later, his strategy may not work, and he may have to resell at a loss. Therefore, a budget that is reasonable in both directions must be put in place by the entity.

Let's say he is long, meaning buying, three ICE EUA Futures DEC22 contracts on 23rd May 2022, the price that day was 78.15 Euro. *Fig.6* represents the contract for the last 3 months. One contract represents, as per ICE market spec, one lot of 1000 EUAs. Each EUA has an entitlement to emit one tonne of carbon dioxide equivalent gas. In this example, we assume that the initial margin has already been paid earlier when the shipowner traded another EUA contract. Additional fees must be considered for this type of contract. As per ICE Fees Platform, for Carbon Futures contract, a total of 5\$/lot is asked, see *Table 3*. We obtained the dollar/euro exchange rate from the European Central Bank Statistical Data Warehouse for 23rd May 2022 equal to 1 USD = 0.94 EUR. Altogether, the shipowner disbursed 3'306 Euro for this transaction, see *Table 4* for calculation results. The shipowner can now follow the evolution of the market, buy other lots in the coming days if he feels he needs to protect himself and hedge his position. He can then sell and rollforward his positions, going short, hoping that the price has fallen enough to cover the costs of the sale and that his market-to-market (MTM) at the end of the day is positive, which means that he has made a gain on the contract. However, it's important to mention that this example remains hypothetical as, as mentioned previously, it has not yet been decided how much allowances polluters in the maritime transport market will receive. This will be confirmed at the next meeting of the EU Commission.



**Fig. 6 ICE EUA Futures DEC22 3 months chart, EUA Futures | ICE (theice.com)**

**Table 3 Contract Levies – Global Carbon Index Futures**

Contract Levies — Global Carbon Index Futures	Fee (\$/lot)		
	Exchange	Clearing	Total
Futures	1.50	3.50	5.00
Block/EPF/EPS	0.50	4.50	5.00
Cash Settlement	--	1.00	1.00

Source: ICE, Exchange & Clearing Fee, Microsoft Word - Fees\_Current.docx (theice.com), p.2

**Table 4 Carbon Credit Trading for shipowner example**

Contract	Spec	Lot traded	Price 23.05.2022 (Euro)	Fees (\$/lot)	FX rate (USD/EUR)	Total (EUR)
ICE EUA Futures Dec22	1 lot of 1000 EUAs	3	78.15	5	0.94	3'306

This chapter has highlighted our knowledge of the subject, obtained using many different literature materials. It has allowed us to lay the foundations of our thesis project, to provide details and explanations for the important aspects and components of our research question such as an introduction to the Capesize and Panamax vessels, the basics of the freight market and an introduction to risk management using techniques such as the use of derivatives, but also a very topical issue today, that of the decarbonisation of the sector, a key point in our project to reduce carbon emissions as much as possible and create a much greener but still efficient system to meet the growing demand for products and services.

## **Chapter Three**

### **Data and Methodology**

Chapter three is considered as one of the most important part of our master thesis as it is used to give an overview of the different data, techniques and models used to provide a reliable and strong answer to our research question. This is a slightly different chapter from the previous one as we detail the mathematical methods and databases used for our research. We also detail the reason for our methods' choice and how these methods seem to be an efficient and strong tool to answer our question. We selected for this study, two time-varying risk models, RiskMetrics and GARCH, which provide us a reliable analyse of the carbon and non-carbon indexed freight volatility.

In order to analyse the impact of a carbon tax on freight prices, we will rely on three sets of data. The first is extracted from the web page of EEX Group, the European Energy Exchange, the leading energy exchange in Europe which offers various contracts in energy commodities such as power, gas, freight, and agricultural products. We are also interested in the fact that it is an exchange that also deals with the spot and derivative market of the EU emission allowance since 2005 based on the EU ETS. Recently it started to offer an index for freight, the EEX Zero Carbon Freight Index (ZCFI). With this index, market participants can get an idea of the impact of the cost of carbon on current freight prices. Here is EEX's own definition of the index:

The new EEX Zero Carbon Freight Index calculates the synthetic price of daily FFA time-charter rates for both Capesize and Panamax vessels, which are adjusted for the cost of carbon. Price information is taken from the highly liquid EEX Dry Freight FFA market which is then combined with EEX EUA Futures to create a daily "Zero Carbon FFA" rate which reflects a 100% carbon reduction. (EEX Group)

The index is calculated as per the formula below; one part is related to the FFAs for Capesize and Panamax vessels and the second part is obtained by multiplication of the December European Union Allowance Futures Market (EUA) with a specific predetermined carbon conversion factor, see *Table 5* and *Table 6* obtained from the International Maritime Organisation (IMO) report on "Energy Efficiency Of Ships", published on 10<sup>th</sup> March 2021 and an adjustment of currency from EUR to USD reported from the European Central Bank (ECB) to match the FFA market unit of measure. We extracted the database directly from the EEX website. This database starts on 6th January 2020 and ends on 27th June 2022, date at which we extracted it. The other sets of data which we use for this thesis project are related to the forward freight agreement for Capesize and Panamax vessels and were extracted from the Baltic Exchange. The data sets are a representation of the Baltic Forward Assessment (BFAs) which is a strong and reliable source of forward freight agreement prices. To compare the sets of data we decided to create a sample with the following range: from 6th January 2020 to 7th June 2022. We selected as data the BCI 5TC which is the average of five different routes in the world (C8\_14 to

C10\_14, C14, C16) and the BPI 4TC the average of four routes (P1A\_03 to P4\_03). *Table 7* and *Table 8* summarise the freight indexes used in this analysis and their respective descriptions.

**Table 5 ZCFI Index Calculation**

Index calculation:

$$ZCFI = \frac{\Sigma FFA\_Price \times FFA\_Volume}{\Sigma FFA\_Volume} + [(FC \times CCF) \times (EUA^{Dec} \times EURUSD)]$$

Legend:

	Description	Unit	Capesize	Panamax
FFA_	Front Month EEX FFA	USD / DAY	VWAP C5TC	VWAP P5TC
FC	Fuel Consumption	Metric Tonnes (MT) / day	60	30
CCF	Carbon Conversion Factor	MT CO <sub>2</sub> / MT Heavy Fuel Oil (HFO)	3.114	3.114
EUA <sup>Dec</sup>	Front December EEX EUA Futures	EUR / MT	DSP	DSP
EURUSD	Currency conversion	1 EUR / USD	ECB	ECB

Source: EEX Zero Carbon Freight Index

**Table 6 Types of fuels and CfFactors selectable in the IMO Ship Fuel Oil Consumption Database, IMO, MEPC 77/6/1**

Type of fuel	Carbon conversion factor (C <sub>F</sub> )
Diesel/Gas Oil	3.206
Light Fuel Oil (LFO)	3.151
Heavy Fuel Oil (HFO)	3.114
Liquefied Petroleum Gas (LPG) – Propane	3.000
Liquefied Petroleum Gas (LPG) – Butane	3.030
Liquefied Natural Gas (LNG)	2.750
Methanol	1.375
Ethanol	1.913

Source : IMO, *Energy Efficiency of Ships, MEPC 77/6/1, 2021, p.15, AIR POLLUTION AND ENERGY EFFICIENCY* (imo.org)

**Table 7 BCI 5TC Routes Description**

Route	Description	Capacity (dwt)	Weighting
C8_14	Gibraltar/Hamburg transatlantic round voyage	180'000	25%
C9_14	Delivery Amsterdam-Rotterdam-Antwerp range or passing Passero, redelivery China-Japan range	180'000	12.50%
C10_14	China-Japan transpacific round voyage	180'000	25%
C14	Delivery Qingdao spot or retroactive up to a maximum 15 days after sailing from Qingdao, round voyage via Brazil, redelivery China-Japan range	180'000	25%
C16	Delivery North China-South Japan range, 3-10 days from index date for a trip via Australia or Indonesia or US West Coast or South Africa or Brazil. Redelivery UK-Cont-Med within Skaw-Passero range	180'000	12.50%

Notes: Capesize vessel for Timecharter routes are based on following description: 180'000mt dwt on 18.2 SSW draft, Max age 10yrs, LOA 290m, beam 45m, TPC 121, 198'000cbm grain, 14 knots laden / 15 knots ballast on 62mt fuel oil (380cs t), no diesel at sea, 12 knots laden / 13 ballast on 43mt fuel oil (380cs t), no diesel at sea

Source: Baltic Exchange

**Table 8 BPI 4TC Routes Description**

Route	Description	Capacity (dwt)	Weighting
C8_14	Gibraltar/Hamburg transatlantic round voyage	180'000	25%
C9_14	Delivery Amsterdam-Rotterdam-Antwerp range or passing Passero, redelivery China-Japan range	180'000	12.50%
C10_14	China-Japan transpacific round voyage	180'000	25%
C14	Delivery Qingdao spot or retroactive up to a maximum 15 days after sailing from Qingdao, round voyage via Brazil, redelivery China-Japan range	180'000	25%
C16	Delivery North China-South Japan range, 3-10 days from index date for a trip via Australia or Indonesia or US West Coast or South Africa or Brazil. Redelivery UK-Cont-Med within Skaw-Passero range	180'000	12.50%

Notes: Capesize vessel for Timecharter routes are based on following description: 82'500mt dwt on 14.43m SSW draft, Max age 12yrs, LOA 229m, beam 32.25m, TPC 70.5, 97'000 cmb grain, 13.5 knots laden on 33mt fuel oil (380cs t) / 14 knots ballast on 31mt fuel oil (380cs t) + 0.1 MGO at sea, 11.5 knots laden on 22mt fuel oil (380cs t) / 12.5 ballast on 23mt fuel oil (380cs t) + 0.1 MGO at sea

Source: Baltic Exchange

Firstly, we performed an analysis on the characteristics of the data sets with descriptive statistics tools. These types of tools are used for information purposes, to obtain more detail about the distribution of the variables being tested. The variables we test in this project are only those of freight rates, part of which is indexed by a carbon charge. As we did not obtain the data by using methods such

as questionnaires or other statistical proofs but rather by using special reports from data providers such as the Baltic Exchange, Clarkson' Shipping Intelligence and many others, those data are considered as secondary sources. With this descriptive analysis, we calculated the four moments of our variables, namely the mean, the variance, the skewness, and the kurtosis. It should be noted that although the average is a widely used instrument, the disadvantage is that the response can sometimes be affected by extreme data that could bias the final result. For this reason, we also decided to construct the median and the mode in order to have a more thorough and accurate analysis of the variables studied. Furthermore, as part of our analysis we computed the variance but also the standard deviation, a useful and most common tool for risk management. It is computed by taking the square root of the variance, the basic concept being that this tool measures the dispersion of the variables regarding its mean. When the level of dispersion is high, the volatility is high, thus the investment is riskier.

Another important piece of information to mention is that instead of using a daily variance and standard deviation, we have annualised the variables which allows us to compare more easily and accurately. Furthermore, testing only the standard deviation and variance for this type of data is not so accurate because as mentioned above, the shipping and freight rate market is strongly based on the relationship between demand and supply. And therefore, as volatility can vary, we need to take this into account in our analysis. So, to deepen our analysis, we chose to test the volatility of freight rates with and without carbon indexation and the evolution since January 2020. We produced risk estimates and more precisely, time-varying risk models for Capesize and Panamax FFAs and Carbon-Zero FFAs and compared them. An important aspect of the FFA market and its risk scheme was detailed by Alizadeh and Nomikos in their book "Shipping Derivatives and Risk Management". They explained that the nearest contracts have a higher volatility than contracts far away, a pattern known as "volatility term structure" (Alizadeh and Nomikos, 2009, p.168). This concept joins that of mean reversion in spot freight rates. Basically, a long-term average should have a lower risk than a short-term average. Volatility is by definition independent of maturity and time horizon (Adland, Ameln, Børnes, 2020).

By using this method, we are able to identify the risk levels at specific points of time as freight risk evolves over time. We decided to compare the FFA with the Carbon-

Zero FFA as differences may exist between those two indexes. These differences may in part be due to the inclusion of additional variables in the FFA rates with carbon indexation. Indeed, this can lead to a higher risk as the data is not only subject to the risks of one variable, in this case FFAs, but also to those of the adjacent carbon market through the variables "Front December EEX EUA Futures" and the other three variables used to create the ZCFI index such as the fuel consumption and carbon conversion factors and the impact of the EU/USD FX rate.

On the other hand, the FFAs for the Capesize and Panamax vessels are mainly affected by the current supply of vessels and the demand for one of these vessels and to a lesser extent by other variables such as political and economic tensions but also by the price of the commodities to be transported. Furthermore, as the creation of the derivative market for FFA is quite recent, and as the market evolves slightly differently than other derivative markets (market for non-storable sea transportation service), with lack of price transparency in the market (private negotiations between buyers and sellers, through a FFA Broker), illiquidity, thin trading and transition from OTC to cleared contract trading over its life (*A.H. Alizadeh, 2013*) makes it appealing to analyse. Market illiquidity is an important aspect that needs to be analysed by shipowners but also all the other market players as it impacts the final performance (*Amir H. Alizadeh, Konstantina Kappou, Dimitris Tsnouknidis, Ilias Visvikis, 2015*).

We used the RiskMetrics method, also known as Exponentially weighted average volatility (EWAV). We could have based our analysis also on the rolling window volatility method, but the latter can sometimes be inaccurate and lack robustness. Nevertheless, these methods use historical volatility, and the result can then be used as a basis for risk management (VaR analysis, value-at-risk) but also when one wants to protect oneself on the market by using derivatives for instance.

$$\sigma_t^2 \approx (1 - \lambda) \sum_{i=1}^n \lambda^{i-1} (r_{t-i} - \bar{r})^2$$

Equation which can also be written under another form:

$$\sigma_t^2 \approx \lambda \sigma_{t-1}^2 + (1 - \lambda) r_{t-1}^2$$

Where  $\lambda$  is the volatility decay factor,  $\sigma_t^2$  is the variance at time  $t$  and  $r$  the return component computer as the log of the price ratio between final and start prices. For our analysis we decided to use a  $\lambda$  value of 0.94. “It’s been shown that values of  $\lambda$  between 0.90 and 0.98 are sufficient to capture the dynamics of volatility of many assets when daily or weekly observations are used.” (Amir H. Alizadeh, Nikos K. Nomikos, 2009)

As part of our time-varying risk model, and thus to forecast the volatility of our data, we also estimated a Generalized Autoregressive Conditional Heteroskedasticity model (GARCH), an extension of the ARCH model presented by Bollerslev in 1986. Heteroskedasticity is a term used to describe a variance which is not constant and varies over time, the contrary is presented as homoscedasticity. By carrying out this second analysis, it allows us to obtain a more efficient and stronger analysis. Both Risk Metrics and GARCH (p, q) models are strong volatility modelling tools and are use in financial econometrics, using historical volatility to predict and explain the future volatility. These models are widely used in financial analysis such as option pricing, risk, and portfolio management for instance as they provide strong information of the market instability. RiskMetrics was constructed in Excel and GARCH model with the IHS Markit statistical program EViews12SV. The spreadsheets can be found in the annex of this research paper. For the GARCH model we also based ourselves on the methodology used and explained by Alizadeh and Nomikos in their book Shipping Derivatives and Risk Management (2009). Moreover, we decided to construct a GARCH (1,1), this means that we will use one previous volatility (p) and one previous rate of return (q) to create this model. By using the GARCH (1,1) model, we are trying to mitigate the fact that the variance is changing over time.

In terms of statistical equation, the GARCH model is expressed by the conditional volatility ( $v_t^2$ ) formula:

$$v_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta v_{t-1}^2$$

The realized volatility ( $\varepsilon_t^2$ ) we used for our analysis is calculated by using the following formula:

$$\varepsilon_t^2 = v_t^2 + \mu_t$$

To obtain the GARCH parameters  $(\mu, \omega, \alpha, \beta)$  we used the software EViews12SV and maximized the log likelihood formula:

$$\mathcal{L}(\mu, \omega, \alpha, \beta) = \frac{1}{v^t \sqrt{2\pi}} e^{-\frac{\varepsilon_t^2}{2v_t^2}}$$

We decided to use those two risk models as we find important to compare the volatility of zero-carbon freight with the FFA rates. These two methods will help us to understand the volatility scheme for each data set and provide us important information on the future outlook for those freight rates and help us to understand the impact of the carbon price introduction on freight rates. Both Risk Metrics and GARCH models are strong and simple tools to model the volatility of a financial instrument. And as the carbon-indexed freight rates are constructed differently than a normal FFA, the analysis might provide us interesting results. Moreover, if the schemes are significantly different, the carbon indexation could highly impact the future of the freight market. We expect that the volatility of the indexed carbon price variable should be higher than the one related solely to FFA and thus showing us that this variable presents a higher risk than the Capesize and Panamax freight rates without this indexation. Our hypothesis is based on the rationale that, as mentioned earlier in our analysis, the ZCFI index being constructed with several variables, also implies a higher risk when other markets are involved.

The Data and Methodology chapter detailed the database and methods used in our research project. It provided explanations of the different models used to describe the volatility component of the ZCFI index and the FFAs. RiskMetrics and GARCH models are useful tools for risk management as they provide an overview and expectation of future volatility. Volatility is an extremely important component in the risk management valuation process as the market player try to protect their portfolio of unexpected changes which could negatively impact their final returns and thus it has an important role in the risk management decision process for all types of companies such as shipping companies active in the derivative market. The next chapter will be used to analyse the results and the impact of our analysis.

## **Chapter Four**

### **Empirical results**

In this section we will review the quantitative study performed in chapter three and make concisely and detailed comments and explanations from the results obtained. The goal of this chapter is to provide a strong answer to our research question by using the various quantitative methods presented in the previous chapter and to finally evaluate the results obtained.

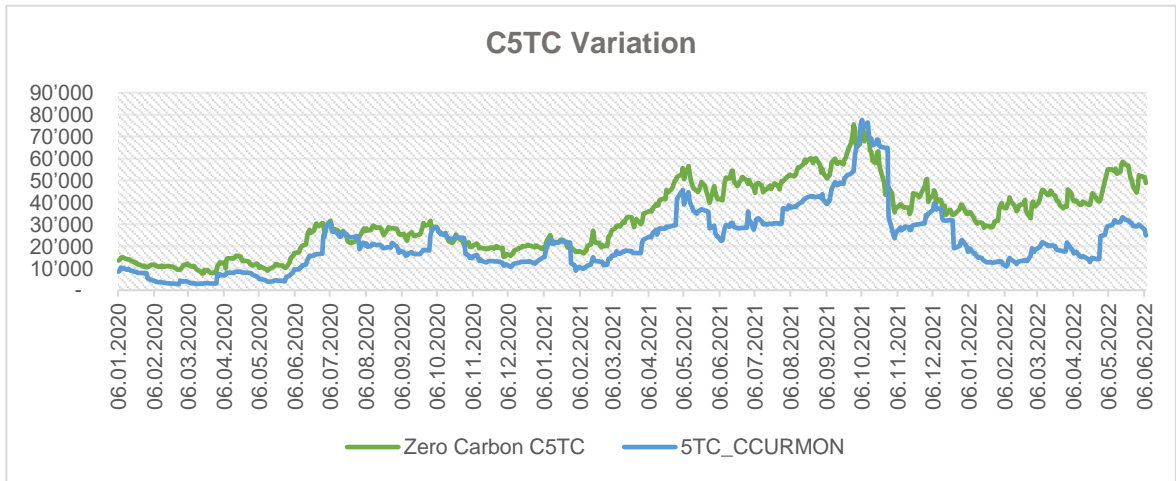
*Table 9* summarises the descriptive statistics of our data. We calculated the 4 moments of the tested variables. Skewness provides us a measure of asymmetry, thus the deviation from the normal distribution. All the four variables have a positive skewness, therefore are represented as right skewed. Zero-Carbon C5TC, Zero Carbon P4TC and 4TC\_PCURMON have values close to zero and are thus more symmetric than the 5TC\_CCURMON variable. Then, we computed the kurtosis, a statistical tool to describe the shape of the distribution. The two carbon indexed variables and the Panamax 4TC variable all have negative values, meaning their distribution shape is flatter and with thinner tails than a normal distribution and the values are located near the mean. The Capesize 5TC variable on the other hand has a positive kurtosis, therefore its distribution shape has a sharper peak than the normal distribution. It also means that less data is located near the mean.

**Table 9 Descriptive statistics for different sizes of vessels and different freight rates**

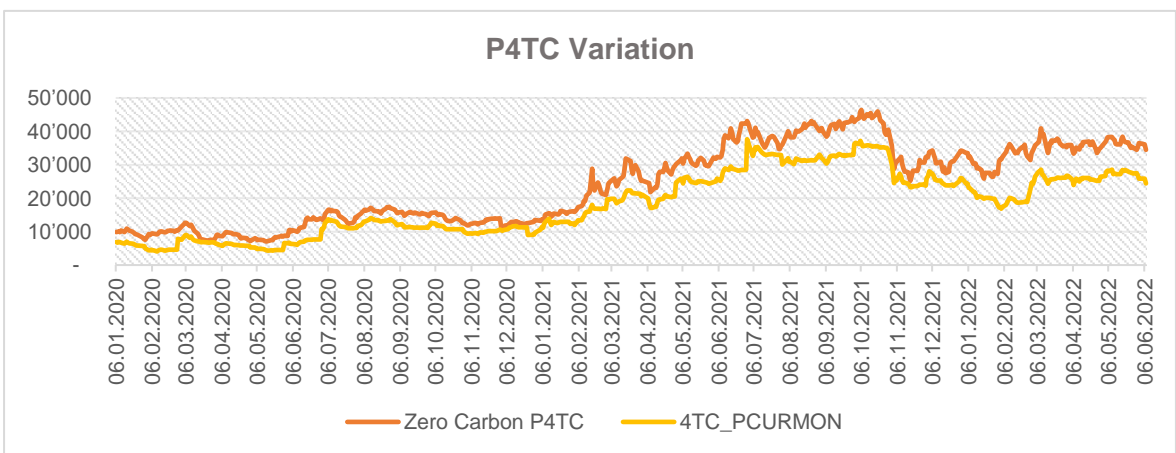
	Capesize vessel		Panamax vessel	
	Zero Carbon C5TC	5TC_CCURMON	Zero Carbon P4TC	4TC_PCURMON
<b>Mean \$/day</b>	32'830	22'294	24'338	18'436
<b>Log return mean %</b>	0.520	0.440	0.510	0.513
<b>Log return standard deviation %</b>	0.919	1.445	0.648	0.739
<b>Kurtosis</b>	(0.785)	2.184	(1.485)	(1.247)
<b>Skewness</b>	0.296	1.281	0.094	0.170

Then, in order to create a time-varying risk models with Risk Metrics and GARCH, we had to compute several values. First, we plotted the variables, see *Fig.7* and *Fig.8*. This first analysis showed us the variation of the different indexes over the testing period, and we see that the Zero-Carbon index for both Capesize and Panamax vessels is higher during the whole period. This is reasonable as the freight rates obtained with those indexes are impacted by the carbon additional cost. Both carbon indexed and non-carbon indexed freight rates faced similar changes over the period. Indeed, in 2020 the rates increased sharply due to the Covid-19 pandemic. Moreover, demand for goods surged in the second half of 2020 and through 2021, as more people purchased goods rather than services during pandemic lockdowns and restrictions. The new way of working imposed on

employees, the home-office, has disrupted markets and supply chains. In addition, companies for which it was difficult to stop production had to find storage facilities and this also impacted on freight rates. As Capesize vessels transport more than 50% of the world's iron ore and Panamax mostly coal, shocks in these markets will impact the freight rates. According to 2019 levels, China was the largest importer of iron ore and coal, and Australia the largest exporter of iron ore and Indonesia the largest for coal, and thus a large part of the impacts will be due to these countries' actions. In 2021, the blockage in March by a container vessel of the Suez Canal, one of the major commercial channels with approximately 19'000 vessels per year, had a significant impact on freight rates as well as port congestion problems. At the end of 2021, we faced a drop in the freight rates, mainly explained by a reduced level of port congestion but also "re-pricing in commodities including iron ore, coal, and various industrial resources" (Dajein Lee, 2021). In 2022, the market will again experience other problems, such as the war in Ukraine which put a halt to important grain exports from this country which did not help the already tense situation.

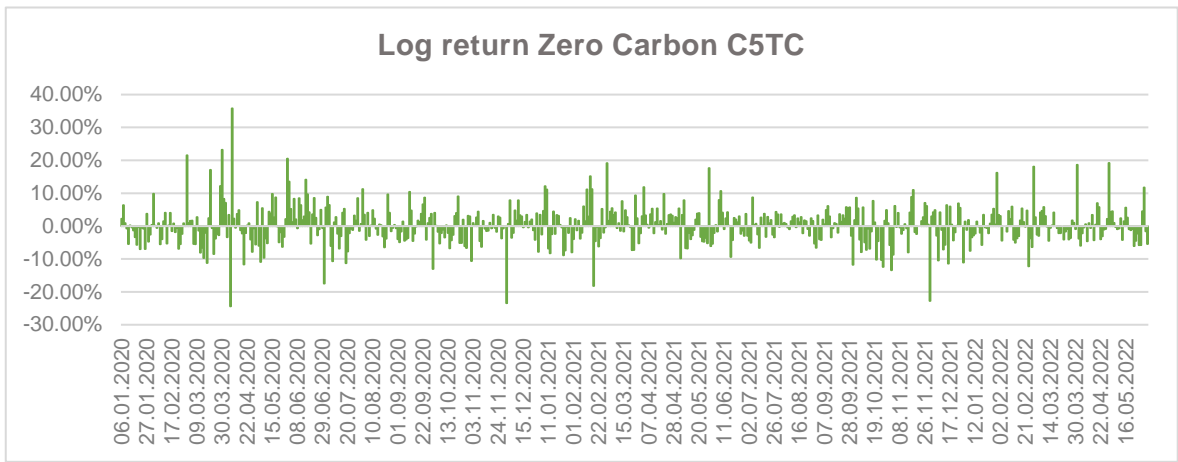


**Fig. 7 Variation between Capesize C5TC Zero Carbon Index and 5TC\_Capsize Current Month**

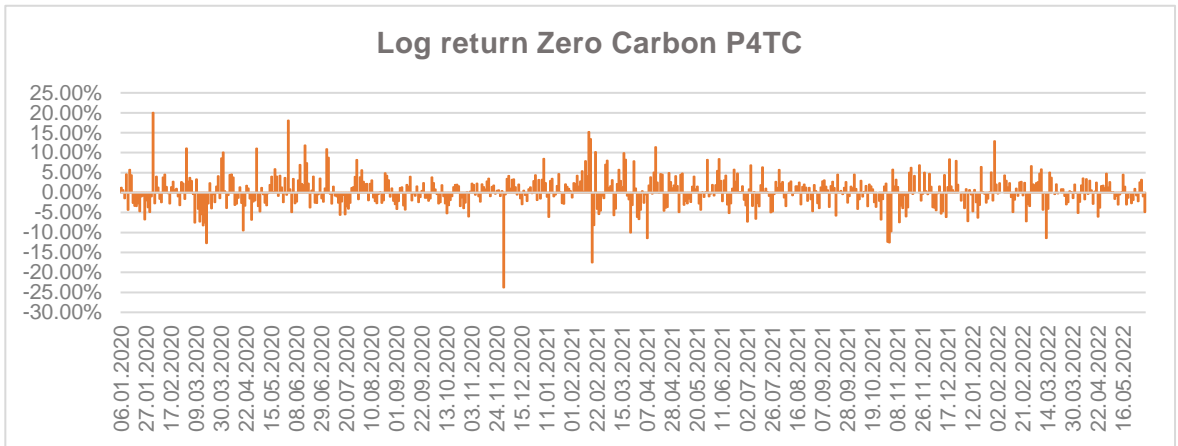


**Fig. 8 Variation between Panamax C4TC Zero Carbon Index and 4TC\_Panamax Current Month**

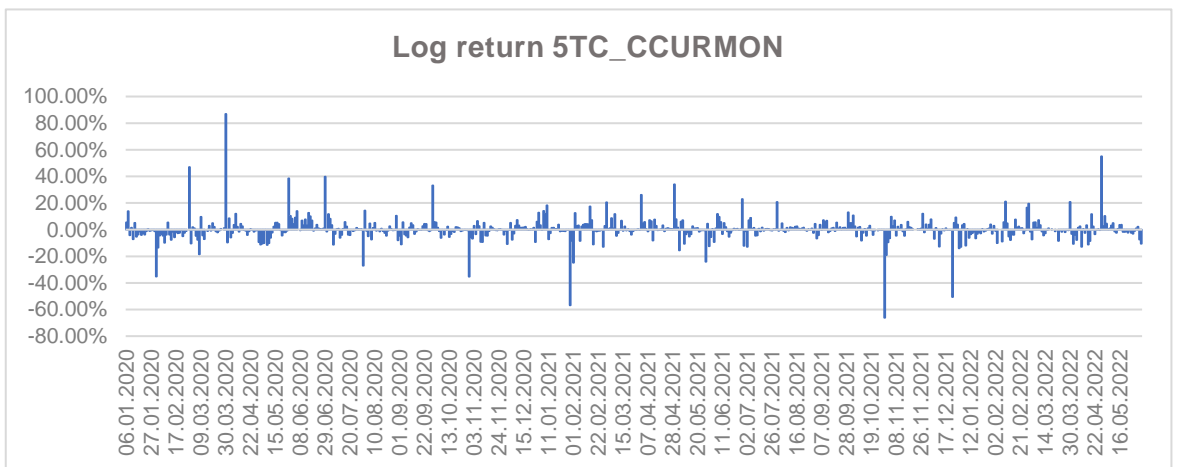
Then, we computed log returns for each variable. This statistical tool is useful as we are interested in the price changes (returns) during a certain period in order to value the volatility, see *Fig.9* to *Fig.12*. Once we computed the log returns, we were able to use the results to create the RiskMetrics and GARCH models.



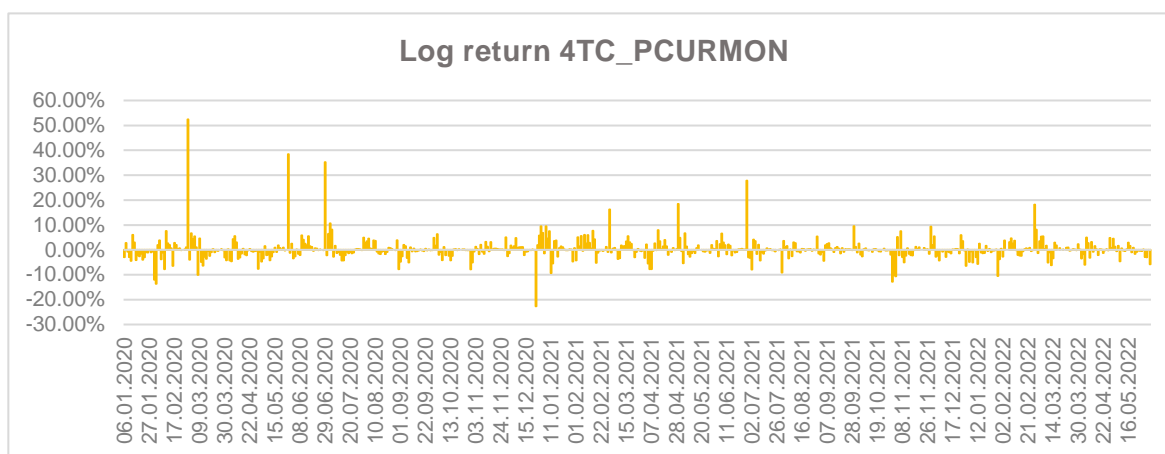
**Fig. 9 Log return for Zero Carbon 5TC freight rate**



**Fig. 10 Log return for Zero Carbon 4TC freight rate**



**Fig. 9 Log return for 5TC Current Month freight rate**



**Fig. 10 Log return for 4TC Current Month freight rate**

As explained in chapter three, we estimated GARCH with the IHS Markit program Eviews12SV as Excel is not a robust program for statistical and econometrics analysis. *Table 10 to 13* present the summary of each variable ( $\omega, \alpha, \beta$ ) for the four freight rates we analysed. And we can conclude that for all the four GARCH models, the GARCH term ( $\beta$ ) is higher than the ARCH term ( $\alpha$ ) showing us that the GARCH effects are stronger than those from ARCH, meaning that the volatility effects have a higher impact than historical shocks ones. Also, as all GARCH terms have also their p-value below 0.05 means they are all statistically significant.

**Table 10 GARCH model estimated with EViews for Zero-Carbon 5TC freight rate**

Dependent Variable: @PC(ZC5TC)  
 Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)  
 Date: 08/04/22 Time: 17:01  
 Sample (adjusted): 1/07/2020 5/13/2022  
 Included observations: 614 after adjustments  
 Convergence achieved after 25 iterations  
 Coefficient covariance computed using outer product of gradients  
 Presample variance: backcast (parameter = 0.7)  
 GARCH = C(2) + C(3)\*RESID(-1)^2 + C(4)\*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.376566	0.225362	1.670934	0.0947
Variance Equation				
C	1.475560	0.487693	3.025590	0.0025
RESID(-1)^2	0.035822	0.006185	5.791732	0.0000
GARCH(-1)	0.922914	0.018784	49.13317	0.0000
R-squared	-0.000000	Mean dependent var	0.379027	
Adjusted R-squared	-0.000000	S.D. dependent var	5.943566	
S.E. of regression	5.943566	Akaike info criterion	6.360849	
Sum squared resid	21654.83	Schwarz criterion	6.389644	
Log likelihood	-1948.781	Hannan-Quinn criter.	6.372047	
Durbin-Watson stat	1.769036			

**Table 11 GARCH model estimated with EViews for Zero-Carbon 4TC freight rate**

Dependent Variable: @PC(ZC4TC)  
 Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)  
 Date: 08/04/22 Time: 16:55  
 Sample (adjusted): 1/07/2020 5/13/2022  
 Included observations: 614 after adjustments  
 Convergence achieved after 24 iterations  
 Coefficient covariance computed using outer product of gradients  
 Presample variance: backcast (parameter = 0.7)  
 GARCH = C(2) + C(3)\*RESID(-1)^2 + C(4)\*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.322054	0.167529	1.922374	0.0546

Variance Equation

	Coefficient	Std. Error	z-Statistic	Prob.
C	5.316479	2.326828	2.284862	0.0223
RESID(-1)^2	0.083797	0.030470	2.750165	0.0060
GARCH(-1)	0.600008	0.162252	3.698007	0.0002

R-squared	-0.000067	Mean dependent var	0.288326
Adjusted R-squared	-0.000067	S.D. dependent var	4.116467
S.E. of regression	4.116606	Akaike info criterion	5.644429
Sum squared resid	10388.17	Schwarz criterion	5.673224
Log likelihood	-1728.840	Hannan-Quinn criter.	5.655627
Durbin-Watson stat	1.564212		

**Table 12 GARCH model estimated with EViews for Panamax 4TC freight rate**

Dependent Variable: @PC(\_4TC)  
 Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)  
 Date: 08/04/22 Time: 20:56  
 Sample (adjusted): 1/07/2020 5/13/2022  
 Included observations: 614 after adjustments  
 Convergence achieved after 29 iterations  
 Coefficient covariance computed using outer product of gradients  
 Presample variance: backcast (parameter = 0.7)  
 t-distribution degree of freedom parameter fixed at 10  
 GARCH = C(2) + C(3)\*RESID(-1)^2 + C(4)\*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.117534	0.121812	-0.964878	0.3346

Variance Equation

	Coefficient	Std. Error	z-Statistic	Prob.
C	2.579833	0.369239	6.986899	0.0000
RESID(-1)^2	0.185741	0.048099	3.861669	0.0001
GARCH(-1)	0.443878	0.071241	6.230657	0.0000

R-squared	-0.007041	Mean dependent var	0.322493
Adjusted R-squared	-0.007041	S.D. dependent var	5.248278
S.E. of regression	5.266722	Akaike info criterion	5.253043
Sum squared resid	17003.62	Schwarz criterion	5.281837
Log likelihood	-1608.684	Hannan-Quinn criter.	5.264240
Durbin-Watson stat	1.866169		

**Table 13 GARCH model estimated with EViews for Capesize 5TC freight rate**

Dependent Variable: @PC\_5TC  
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)  
Date: 08/04/22 Time: 21:05  
Sample (adjusted): 1/07/2020 5/13/2022  
Included observations: 614 after adjustments  
Convergence achieved after 36 iterations  
Coefficient covariance computed using outer product of gradients  
Presample variance: backcast (parameter = 0.7)  
t-distribution degree of freedom parameter fixed at 10  
GARCH = C(2) + C(3)\*RESID(-1)^2 + C(4)\*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.026381	0.262883	-0.100353	0.9201
Variance Equation				
C	14.55090	3.481199	4.179852	0.0000
RESID(-1)^2	0.059916	0.024255	2.470249	0.0135
GARCH(-1)	0.457080	0.124056	3.684474	0.0002
R-squared	-0.003927	Mean dependent var		0.614083
Adjusted R-squared	-0.003927	S.D. dependent var		10.22859
S.E. of regression	10.24866	Akaike info criterion		6.708817
Sum squared resid	64386.44	Schwarz criterion		6.737611
Log likelihood	-2055.607	Hannan-Quinn criter.		6.720014
Durbin-Watson stat	1.874606			

Surprisingly, our hypothesis turns out not to be as robust as expected as the result of our analysis shows a higher volatility for the variables without carbon indexation, see *Fig.13* and *Fig.14* for Risk Metrics model. With GARCH model we created a graph to compare the conditional variance with the returns for each tested freight rates, see *Figure 15 to 18*. As per the RiskMetrics model, we see that both Panamax 4TC and Capesize 5TC FFA have a higher volatility over the period than the Zero-Carbon indexes.

One of the most plausible reasons for this difference is related to the positive impact of diversification. Indeed, as the ZCFI is constructed with different variables, which all evolve individually on one side but also with similarities, we might expect a lessened impact as the index is more diversified and thus might be less risky. The ZCFI is constructed as a portfolio of emission prices, exchange rate and FFA and thus the impact on FFA is reduced. In finance, and investment management, portfolio diversification is highly used as it proved to be a strong and reliable technique for risk averse investors to obtain a less riskier portfolios but also because the investment is suspected to offer more return as the investors usually increase their market exposure. Moreover, as the portfolio is increasing, the exposure to market volatility is reduced and thus the global investment risk scheme is optimised.

As the FFA rates are not taken individually, the impact on the bulk market is therefore reduced.

Furthermore, the carbon market is regulated and more specifically has market price regulations which protects the EUA price from going too high. As explained by the European Energy Exchange Group,

The EU ETS is a purely volume-based system with free price formation. However, within the system there is the possibility of an increase in the supply of allowances in the event of extreme price fluctuations under Article 29a of the EU ETS Directive. As per this Directive, “if for more than six consecutive months, the allowance price is more than three times the average price of allowances during the two preceding years, the Commission shall convene a meeting of the Climate Change Committee. (EEX Group)

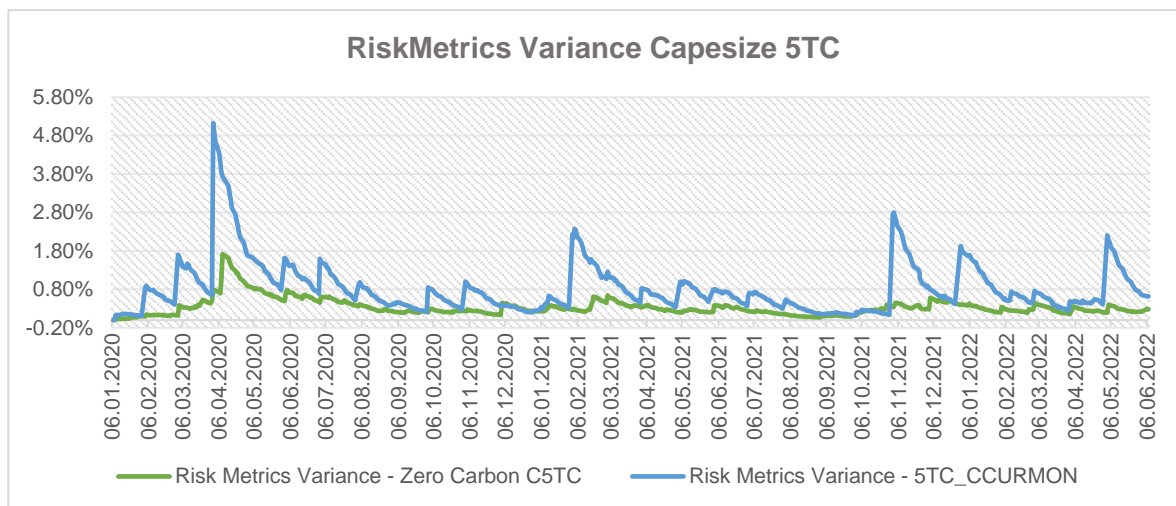
Moreover, if carbon emissions market players are not compliant, they are intended to pay 100 CHF + the price of the carbon. This fine amount also puts a limit on the EUA’s price as if the price increases above 100, buying carbon credit becomes less attractive. These 2 facts might have a potential impact on the overall volatility in this market.

Another possible explanation for this difference is that the FFA market is also used as a speculation on the future evolution of the shipping market which can cause a higher volatility. Another point to mention is the variation between the Capesize and Panamax’s volatility. This can be explained by the vessel size difference, smaller vessels being more flexible in terms of port accessibility. “Capesize vessels are mostly chartered for the transportation of iron ore and coal as their size is specifically designed to offer serious economies of scale. This means that cargo and port limitations can render this specific asset class riskier than smaller vessels, namely Panamaxes, Supramaxes and Handysizes.” (Pelagidis, Panagiotopoulos, 2019). As explained in the introduction part of the freight market in chapter 2, the dry bulk market suffered several shocks. First, the Covid-19 pandemic which induced port congestion and supply shortages and therefore an increase in the freight rates to record highs. Secondly, to important weather issues in North America and Asia with

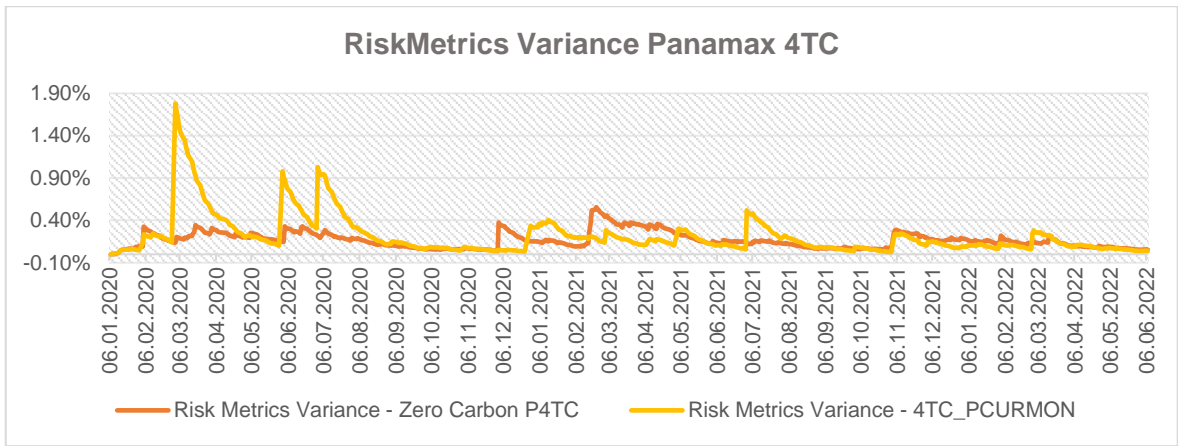
dramatic hurricanes which negatively impacted the market. The dry bulk market is highly impacted by the demand and supply for iron ore and coal as those two commodities are mainly shipping with Capesize and Panamax vessels. Major exporters of iron ore such as Australia, with 53.6% of total iron ore exports in 2021 (Statista, 2022) or Brazil with 20.5% global iron ore exports (Statista, 2022) and for coal (Indonesia, Australia, Russia) have significant impact on freight rates. In March 2022, Russia invaded Ukraine and declared war to the country. This led to major disruptions in the market and as mentioned above, as Russia plays a role in the exports of coal, we faced important issues.

On the other hand, the European carbon market has also been affected by the covid-19 pandemic and the prices have since then considerably fluctuated. We plotted the prices for Capesize and Panamax time-charter rates (5TC, 4TC) and the EUA Futures Dec22 to understand the price variation between those rates.

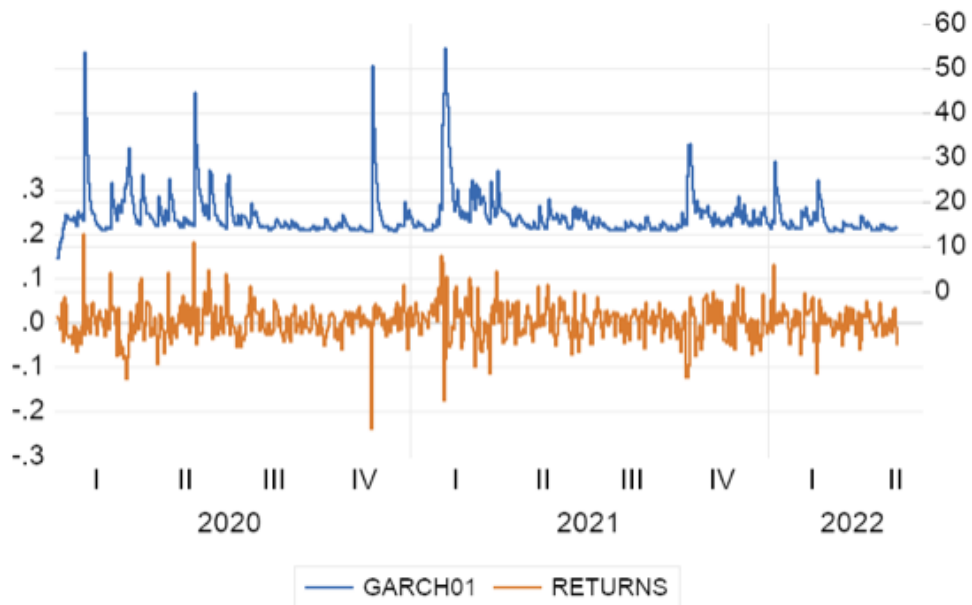
To deepen our analysis and understand the volatility scheme for both carbon indexed and non-carbon index variables, we plotted the freight rates with the EUA Futures Dec 2022 data for the selected period, from 6<sup>th</sup> January 2020 to 7<sup>th</sup> June 2022, see Fig.19 and Fig.20.



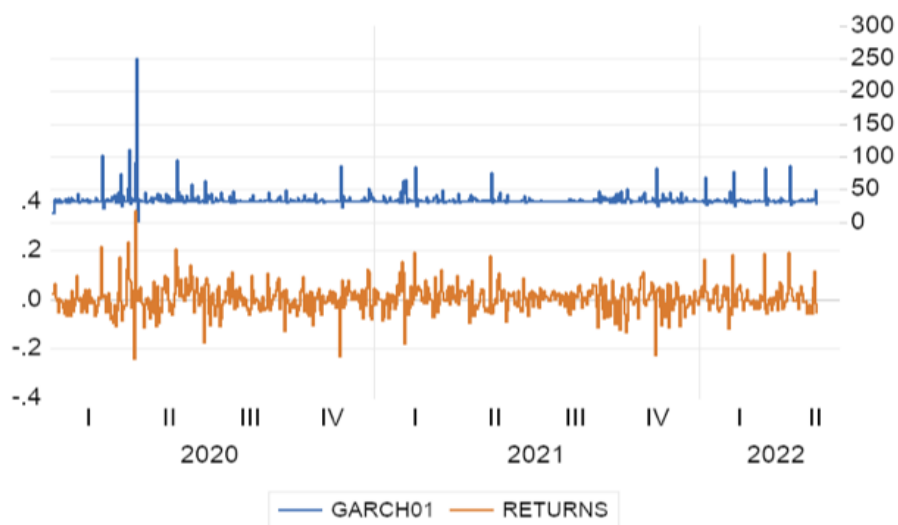
**Fig. 11 RiskMetrics variation between Capesize C5TC Zero Carbon Index and 5TC\_Capesize Current Month**



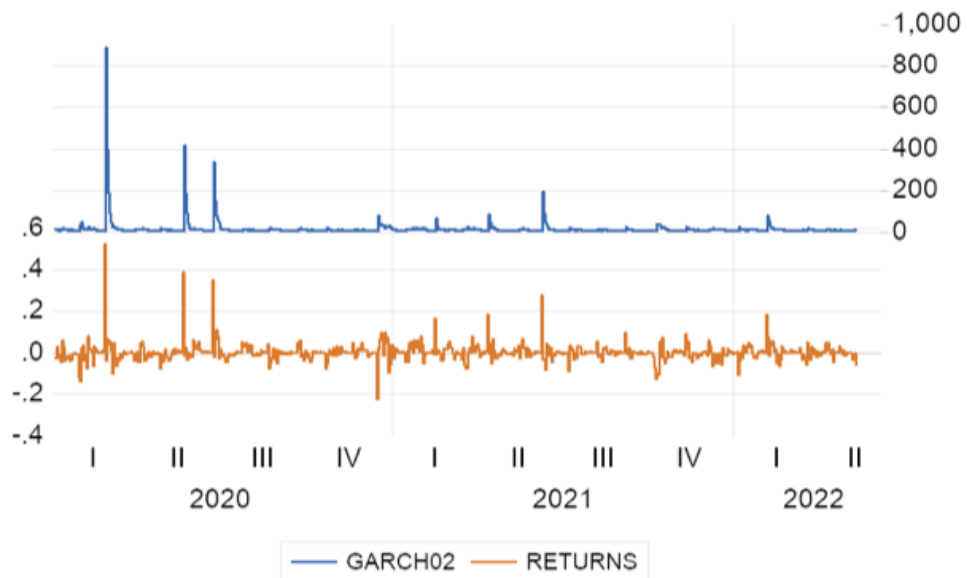
**Fig. 12 RiskMetrics variation between Panamax 4TC Zero Carbon Index and 4TC\_Panamax Current Month**



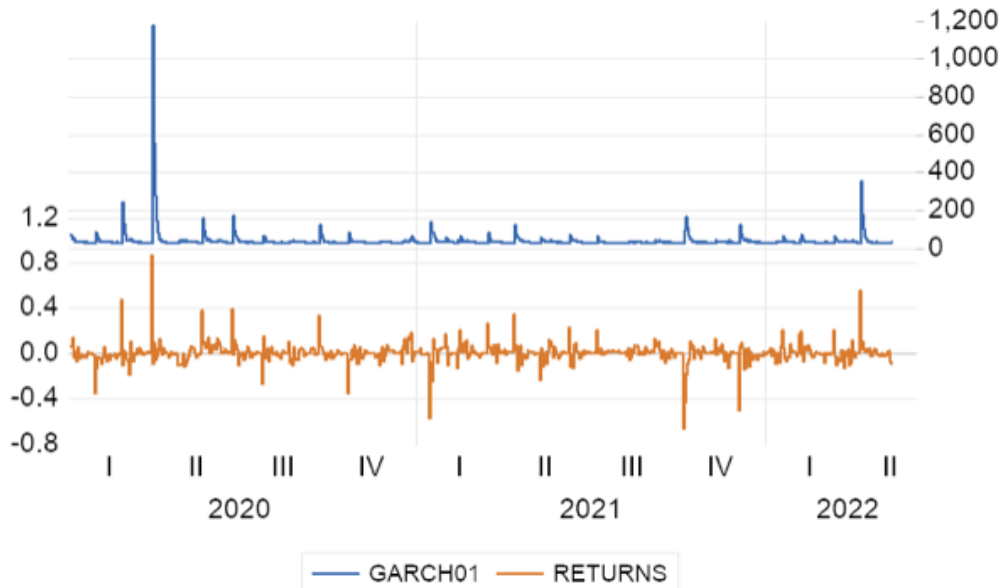
**Fig. 13 GARCH model vs Returns for Zero-Carbon 4TC freight rate**



**Fig. 14 GARCH model vs Returns for Zero-Carbon 5TC freight rate**



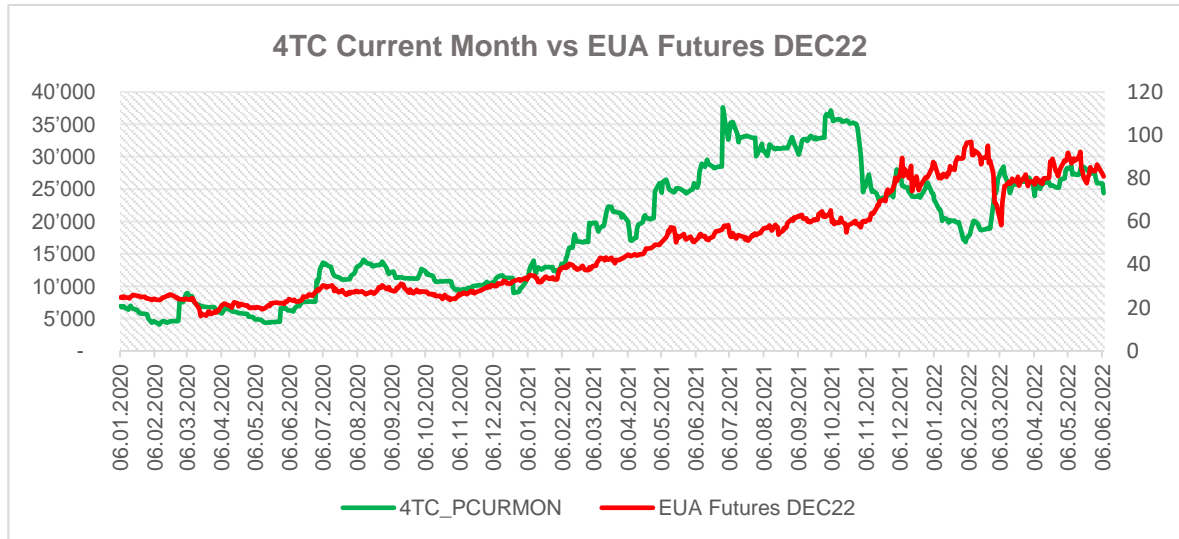
**Fig. 15 GARCH model vs Returns for 4TC freight rate**



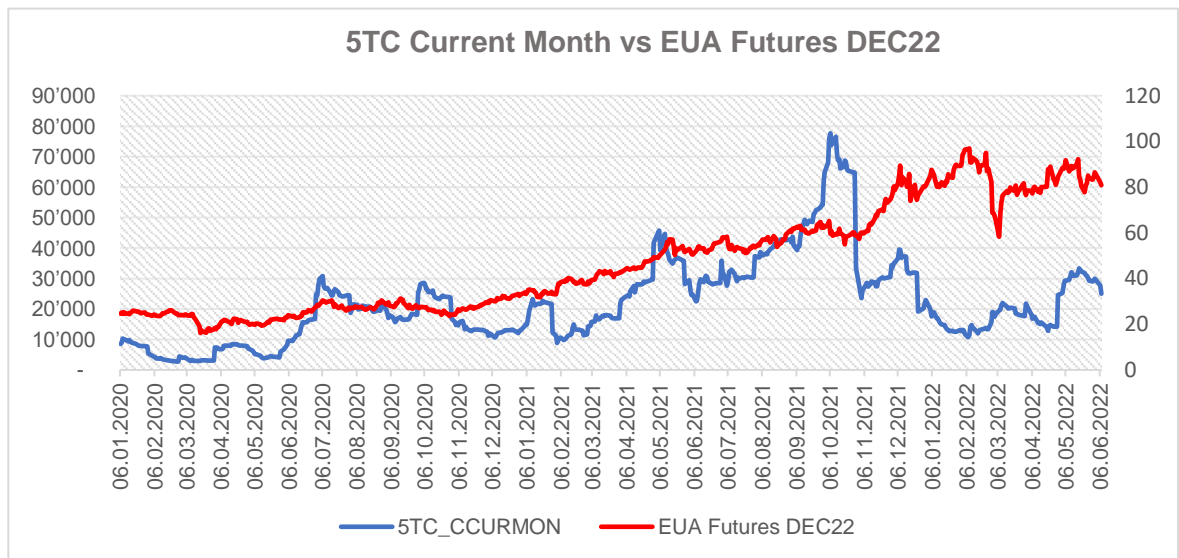
**Fig. 16 GARCH model vs Returns for 5TC freight rate**

The increase of the EUA Futures Dec22 was smoother than the freight prices for both 5TC and 4TC rates. From the beginning of 2020 until November 2021, the carbon price has not been subject to strong price fluctuations, unlike freight which, even though the economy is at a standstill due to the pandemic, the effects of port congestion and other supply shortages have had a strong impact on rates. This price variation must be considered in our volatility analysis. What is interesting to see on the following charts is that in November 2021, uncertainties on iron ore demand coming in from China, coal market facing some disruptions, expected decrease in ports congestion and on the other hand, covid-19 restrictions being gently lifted, and

vaccination progress being made in several countries, altogether impacted freight prices, whose rates fell from record highs while the carbon market rose drastically. This partly explains why the correlation between these two price variables tends to be more negative and therefore confirming the volatility variation we've detected.



**Fig. 17 4TC Curr Month prices vs EUA Futures DEC22 prices**



**Fig. 18 4TC Curr Month prices vs EUA Futures DEC22 prices**

We analysed 4 freight rates, of which 2 with carbon indexation and concluded that these rates evolve differently over the analysed period and that the Zero-Carbon indexes were less volatile, thus less risky than normal FFA, mainly due to the diversification effect of the carbon indexed freight rates.

One might ask whether there might not be another way of imposing and incorporating a carbon charge into the freight market, without having to go through direct indexation of freight rates. Carbon “insetting”, instead of carbon offsetting,

could be an interesting alternative. DHL, one of the leading freight forwarders, presented its idea like this:

While carbon offsetting has a positive impact on the environment, it doesn't reduce the transport sector's carbon footprint. Carbon "insetting" opens a new and very promising pathway to decarbonizing the global freight transportation network. (DHL)

Indeed, the carbon offsetting is a market which is efficient and works quite well, but the transport sector is not usually the sector that is most present in offsetting projects, unlike other sectors, such as renewable energy. Therefore carbon "insetting" could be advantageous as the project it finances remain in the sector where the emissions are emitted, unlike the carbon offsetting projects. Other alternatives were presented by the European Commission in their report entitled Study on assessment of possible global regulatory measures to reduce greenhouse gas emissions from international shipping. They presented the following possible alternatives:

- Three alternative cap&trade emissions trading schemes (ETS)
- Two alternative tax/levy schemes
- Four alternative baseline & credit schemes
- Four alternative standard & penalty
- Four alternative feebate schemes

The European Commission and the International Maritime Organisation are already discussing some of these alternatives and each of them have advantages and disadvantages. Increase the fuel prices in order to indirectly reduce the GHG emission could be an interesting alternative as it will encourage the shift from old propulsion system to new technologies, with less emissions. In our research project we have based ourselves on the solution of including shipping in the ETS market being analysed in our research. But we can conclude that projects are underway and there is a growing interest from governments but also from major players in the different markets to invest in these projects. And I don't think there is already one solution that is fully ready to be established. That's why we need to get more involved so that we can protect our planet for the next generation.

## Chapter Five

### Summary and Conclusions

Decarbonising the maritime transport sector is an important task in our global project to achieve net-zero greenhouse gas emissions by 2050 and thus protect our planet and our environment as best we can. However, this is not a task to be taken lightly. There are still many questions and uncertainties about strategy choices. It is important to find the best strategy, the one that will achieve the set objectives as quickly as possible. Furthermore, with economic (inflationary outlook) and political tensions rising, there are fears about the supply of raw materials, energy security and fuel prices around the world. It is therefore vital that we move forward with our plans to develop alternatives to fossil fuels such as hydrogen or other substances that can be used in a closed circle, i.e., without greenhouse gas emissions. Maritime transport therefore has a strong impact as it will remain the most cost-effective way to transport goods over long distances. The impact of the inclusion of the maritime sector into the European Union Emissions Trading System (ETS) will set a course for maritime emissions and thus demonstrate that a long-term strategy is being put in place by the European Commission. There are still some uncertainties as to the implementation of this new regulation, the precise date of its application and various questions concerning the stakeholders who will have to pay the price of carbon.

Furthermore, it is also important that other governments consider the concern of global warming and impose new regulations, as Europe can already contribute and deal with a significant part of the problem, but this will not be enough. It is also important that in the future governments act together to reduce our carbon emissions and that the International Maritime Organisation, IMO, also takes more restrictive decisions. The problem of global warming must be dealt with in a global way with the interaction of each country. Countries need to communicate with each other to find the best solution to protect our planet, a solution that can be implemented rapidly to alleviate this critical situation.

Our study examined the potential effect of an introduction of the maritime sector into the European Emissions Trading System on the freight prices of Capesize (5TC) and Panamax (4TC) indexes. We also highlighted an example of trading FFA as a shipowner and performed time-varying risk analysis by using the RiskMetrics and

the GARCH models to determine the volatility of the index with and without carbon indexation and obtained surprising results as the EEX Zero-Carbon Freight Index's volatility was lower than the one without the carbon input.

Explanations were proposed, such as the diversification effect, which seems to be the most reliable explanation for these differences, as the Zero-Carbon Freight Index (ZCFI) is constructed as a portfolio of emission prices, exchange rate and FFA rates and thus making it less risky and volatile than normal FFAs. Then we explained that these differences might also take source from macroeconomic factors that affected in a more direct way the time-charter freight rates, related to political and economic tensions on a global scale, disruptions in the supply and/or demand of iron ore and coal, the main commodities transported on Capesize and Panamax vessels.

Altogether, it will be interesting and challenging to reproduce a similar analysis once the European Union has issued the final version of the new regulation for the inclusion of shipping in the European Emissions Trading System and when reliable information regarding the volume of transactions have taken place in the market. Will the volatility of time-charter rates always be greater than for the Zero-Carbon Freight Index? Will this index undergo significant changes when the new regulation is implemented? Or are there any other ways to include the carbon price in the shipping market?

As the economies of several countries recover from the covid-19 pandemic, new tensions, caused among other things by the war in Ukraine, which began in March 2022, will affect the international markets, and certainly freight rates. The current tensions increase the risk of a global food crisis, with many grain shipments currently blocked in Ukraine, although a 26,000-tonne of Ukrainian corn recently left the port of Odessa with experts hoping that further shipments can be made quickly. It is still difficult to answer all these questions, as there are still too many doubts and uncertainties in the market. It will also be interesting to analyse how carbon prices will be allocated to contracts, either directly via the charter parties or by the shipowner applying an estimate in his contract with the other party and communicating the exact cost of carbon at the end of the voyage. These uncertainties should be resolved at the European Union Commission meeting next autumn.

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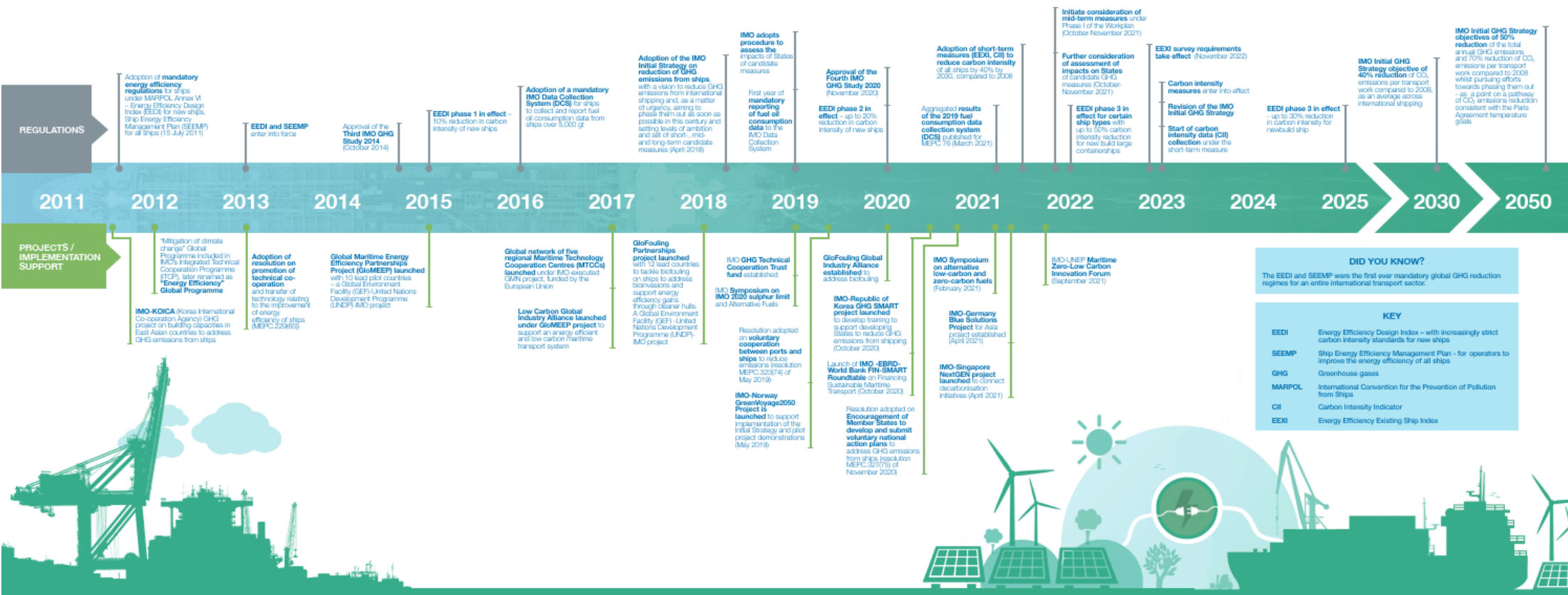
# Appendix A

Source: IMO, [https://wwwcdn.imo.org/localresources/en/MediaCentre/Documents/Addressing%20climate%20change%20-%20a%20decade%20of%20action%20to%20cut%20GHG%20emissions%20from%20shipping\\_FINAL\\_\(14-07-21\)\\_Large.pdf](https://wwwcdn.imo.org/localresources/en/MediaCentre/Documents/Addressing%20climate%20change%20-%20a%20decade%20of%20action%20to%20cut%20GHG%20emissions%20from%20shipping_FINAL_(14-07-21)_Large.pdf)



# Addressing climate change

## A decade of action to cut GHG emissions from shipping



**DID YOU KNOW?**

The EEDI and SEEMP were the first ever mandatory global GHG reduction regimes for an entire international transport sector.

**KEY**

- EEDI - Energy Efficiency Design Index - with increasingly strict carbon intensity standards for new ships
- SEEMP - Ship Energy Efficiency Management Plan - for operators to improve the energy efficiency of all ships
- GHG - Greenhouse gases
- MARPOL - International Convention for the Prevention of Pollution from Ships
- CII - Carbon Intensity Indicator
- EEXI - Energy Efficiency Existing Ship Index



Appendix B

Capesize and Panamax FFA & RiskMetrics calculations

Date	Zero Carbon C5TC	log return	Risk Metrics Variance - Zero Carbon C5TC	Zero Carbon P4TC	log return	Risk Metrics Variance - Zero Carbon P4TC	5TC_CCURMON	log return	Risk Metrics Variance - 5TC_CCURMON	4TC_PCURMON	log return	Risk Metrics Variance - 4TC_PCURMON
06.01.2020	13'620			9'835			8'497			6'922		
07.01.2020	13'927	2.23%	0.00	9'957	1.23%	0.00000000	8'972	5.44%	0.00000000	6'722	-2.93%	0.00000000
08.01.2020	14'841	6.36%	0.00049633	10'020	0.63%	0.00015240	10'300	13.80%	0.00295887	6'909	2.74%	0.00085960
09.01.2020	14'973	0.89%	0.00404202	9'878	-1.43%	0.00004020	9'881	-4.15%	0.01905374	6'859	-0.73%	0.00075291
10.01.2020	14'867	-0.71%	0.00007877	10'342	4.59%	0.00020424	10'019	1.39%	0.00172476	6'663	-2.90%	0.00005275
13.01.2020	14'079	-5.45%	0.00005062	9'905	-4.32%	0.00210337	9'328	-7.15%	0.00019236	6'375	-4.42%	0.00084053
14.01.2020	14'107	0.20%	0.00296821	10'488	5.72%	0.00186398	9'809	5.03%	0.00510691	6'769	6.00%	0.00195238
15.01.2020	14'052	-0.39%	0.00000411	10'956	4.36%	0.00327291	9'306	-5.26%	0.00252805	6'972	2.95%	0.00359631
16.01.2020	13'871	-1.30%	0.00001512	10'676	-2.59%	0.00190517	8'972	-3.66%	0.00277107	6'691	-4.11%	0.00087313
17.01.2020	13'413	-3.35%	0.00016957	10'326	-3.33%	0.00067094	8'850	-1.37%	0.00133596	6'544	-2.22%	0.00169240
20.01.2020	12'672	-5.68%	0.00112451	9'983	-3.38%	0.00111175	8'506	-3.96%	0.00018745	6'378	-2.57%	0.00049349
21.01.2020	12'632	-0.32%	0.00322925	9'715	-2.72%	0.00114197	8'275	-2.75%	0.00157178	6'278	-1.58%	0.00066018
22.01.2020	11'779	-6.99%	0.00000994	9'270	-4.68%	0.00073979	7'975	-3.69%	0.00075806	6'034	-3.96%	0.00024974
23.01.2020	11'718	-0.52%	0.00488950	9'181	-0.97%	0.00219052	7'884	-1.15%	0.00136362	5'856	-2.99%	0.00157143
24.01.2020	11'629	-0.77%	0.00002675	9'108	-0.80%	0.00009483	7'906	0.28%	0.00013170	5'800	-0.96%	0.00089661
27.01.2020	10'847	-6.96%	0.00005912	8'515	-6.73%	0.00006395	7'834	-0.91%	0.00000777	5'738	-1.07%	0.00009233
28.01.2020	11'261	3.74%	0.00483731	8'351	-1.95%	0.00452271	7'791	-0.55%	0.00008370	5'728	-0.17%	0.00011550
29.01.2020	10'743	-4.71%	0.00140040	8'049	-3.68%	0.00038004	7'764	-0.35%	0.00003029	5'672	-0.98%	0.00000304
30.01.2020	10'470	-2.57%	0.00221992	7'667	-4.86%	0.00135643	7'675	-1.15%	0.00001205	5'638	-0.60%	0.00009652
31.01.2020	10'507	0.35%	0.00066189	7'594	-0.95%	0.00236224	5'400	-35.16%	0.00013293	5'000	-12.01%	0.00003615
03.02.2020	11'591	9.82%	0.00001248	9'277	20.02%	0.00009114	4'719	-13.48%	0.12360100	4'363	-13.63%	0.01442196
04.02.2020	11'604	0.11%	0.00964037	9'031	-2.69%	0.04006865	4'516	-4.40%	0.01817159	4'447	1.91%	0.01857170
05.02.2020	11'542	-0.54%	0.00000129	9'401	4.01%	0.00072407	4'369	-3.31%	0.00193338	4'619	3.79%	0.00036366
06.02.2020	11'643	0.88%	0.00002873	9'522	1.28%	0.00161089	4'178	-4.47%	0.00109511	4'447	-3.79%	0.00144009
07.02.2020	11'019	-5.51%	0.00007657	9'374	-1.56%	0.00016390	3'788	-9.80%	0.00199822	4'397	-1.13%	0.00144009
10.02.2020	10'589	-3.98%	0.00304005	9'150	-2.42%	0.00024447	3'647	-3.79%	0.00960292	4'069	-7.75%	0.00012785
11.02.2020	10'746	1.47%	0.00158548	9'505	3.81%	0.00058666	3'847	5.34%	0.00143893	4'388	7.55%	0.00610116
12.02.2020	11'190	4.05%	0.00021629	9'946	4.53%	0.00145474	3'706	-3.73%	0.00285035	4'503	2.59%	0.00569667
13.02.2020	10'613	-5.29%	0.00163881	10'090	1.45%	0.00204909	3'434	-7.62%	0.00139431	4'591	1.94%	0.00066927
14.02.2020	10'633	0.19%	0.00279992	10'074	-0.16%	0.00020900	3'381	-1.56%	0.00581061	4'619	0.61%	0.00037458
17.02.2020	11'069	4.02%	0.00000359	9'803	-2.73%	0.00000252	3'194	-5.69%	0.00024193	4'331	-6.44%	0.00003697
18.02.2020	10'903	-1.51%	0.00161604	9'941	1.40%	0.00074360	3'138	-1.77%	0.00323732	4'453	2.78%	0.00414475
19.02.2020	10'990	0.79%	0.00022819	10'218	2.75%	0.00019461	3'056	-2.65%	0.00031288	4'541	1.96%	0.00077170
20.02.2020	10'791	-1.83%	0.00006287	10'283	0.63%	0.00075566	2'984	-2.38%	0.00070113	4'556	0.33%	0.00038295
21.02.2020	10'726	-0.61%	0.00033364	10'384	0.97%	0.00003990	2'981	-0.10%	0.00056845	4'584	0.61%	0.00001088
24.02.2020	10'013	-6.88%	0.00003676	10'285	-0.95%	0.00009475	2'838	-4.92%	0.00000101	4'581	-0.07%	0.00003754
25.02.2020	9'479	-5.48%	0.00473148	9'966	-3.15%	0.00009030	2'772	-2.35%	0.00241663	4'581	0.00%	0.00000043
26.02.2020	9'258	-2.36%	0.00300070	10'235	2.66%	0.00099244	2'744	-1.02%	0.00055368	4'588	0.15%	0.00000000
27.02.2020	9'337	0.85%	0.00055743	10'471	2.28%	0.00070665	2'744	0.00%	0.00010307	4'634	1.00%	0.00000233
28.02.2020	9'342	0.06%	0.00007150	10'306	-1.59%	0.00052212	4'388	46.95%	0.00000000	7'825	52.39%	0.00009953
02.03.2020	11'585	21.52%	0.00000038	11'514	11.08%	0.00025305	3'956	-10.36%	0.22038972	7'522	-3.95%	0.27447468
03.03.2020	11'694	0.93%	0.04631143	11'838	2.77%	0.01227356	4'028	1.80%	0.01074128	8'038	6.63%	0.00155959
04.03.2020	11'881	1.59%	0.00008619	12'285	3.71%	0.00076991	4'066	0.94%	0.00032532	8'400	4.41%	0.00440209
05.03.2020	12'081	1.66%	0.00025412	12'653	2.95%	0.00137674	3'881	-4.66%	0.00008817	8'866	5.40%	0.00194053
06.03.2020	11'444	-5.42%	0.00027630	12'607	-0.36%	0.00086959	3'597	-7.60%	0.00216847	8'956	1.01%	0.00291514
09.03.2020	10'833	-5.49%	0.00293283	11'696	-7.51%	0.00001279	2'991	-18.45%	0.00577489	8'100	-10.05%	0.00010201

10.03.2020	11'132	2.72%	0.00300857	12'092	3.33%	0.00563607	3'291	9.56%	0.03403744	8'478	4.56%	0.01009214
11.03.2020	10'982	-1.36%	0.00074241	11'610	-4.07%	0.00111009	3'153	-4.28%	0.00913624	8'075	-4.87%	0.00208032
12.03.2020	10'131	-8.06%	0.00018464	10'797	-7.26%	0.00165605	2'938	-7.06%	0.00183502	7'579	-6.34%	0.00237186
13.03.2020	9'483	-6.62%	0.00649683	10'229	-5.41%	0.00526354	2'938	0.00%	0.00498793	7'369	-2.81%	0.00401850
16.03.2020	8'606	-9.70%	0.00437751	9'422	-8.21%	0.00292615	2'909	-0.99%	0.00000000	7'109	-3.59%	0.00078957
17.03.2020	8'432	-2.04%	0.00940931	8'740	-7.51%	0.00674753	2'994	2.88%	0.00009840	7'072	-0.52%	0.00129028
18.03.2020	7'539	-11.20%	0.00041665	7'700	-12.66%	0.00564682	2'972	-0.74%	0.00082949	6'903	-2.42%	0.00002723
19.03.2020	7'723	2.41%	0.01253662	7'493	-2.73%	0.01603868	3'119	4.83%	0.00005439	6'838	-0.95%	0.00058502
20.03.2020	9'163	17.09%	0.00058123	7'673	2.37%	0.00074563	3'184	2.06%	0.00233070	6'856	0.26%	0.00008951
23.03.2020	9'108	-0.60%	0.02921371	7'375	-3.95%	0.00056180	3'144	-1.26%	0.00042542	6'791	-0.95%	0.00000691
24.03.2020	8'367	-8.48%	0.00003608	7'345	-0.40%	0.00156418	3'081	-2.02%	0.00015983	6'775	-0.24%	0.00009074
25.03.2020	8'055	-3.80%	0.00719697	7'171	-2.40%	0.00001629	3'059	-0.72%	0.00040972	6'747	-0.41%	0.00000556
26.03.2020	7'862	-2.42%	0.00144306	7'282	1.54%	0.00057689	3'075	0.52%	0.00005135	6'747	0.00%	0.00001715
27.03.2020	7'650	-2.74%	0.00058677	7'589	4.13%	0.00023645	3'075	0.00%	0.00002722	6'765	0.27%	0.00000000
30.03.2020	8'641	12.19%	0.00075186	7'484	-1.40%	0.00170221	3'109	1.10%	0.00000000	6'756	-0.13%	0.00000710
31.03.2020	10'897	23.19%	0.01485942	8'156	8.61%	0.00019513	7'409	86.84%	0.00012092	6'553	-3.05%	0.00000177
01.04.2020	11'837	8.28%	0.05379442	9'020	10.07%	0.00740807	6'731	-9.60%	0.75410874	6'284	-4.19%	0.00093074
02.04.2020	12'705	7.07%	0.00685086	9'053	0.36%	0.01013050	7'325	8.46%	0.00921058	6'297	0.21%	0.00175697
03.04.2020	12'286	-3.36%	0.00500315	8'710	-3.86%	0.00001298	6'909	-5.85%	0.00715199	6'034	-4.27%	0.00000427
06.04.2020	12'711	3.40%	0.00112631	8'656	-0.62%	0.00149192	6'738	-2.51%	0.00341854	5'763	-4.60%	0.00182015
07.04.2020	9'960	-24.39%	0.00115805	9'050	4.45%	0.00003872	6'981	3.54%	0.00062809	6'016	4.30%	0.00211158
08.04.2020	14'246	35.79%	0.05946380	9'471	4.55%	0.00198260	7'863	11.90%	0.00125522	6'356	5.50%	0.00184594
09.04.2020	14'575	2.28%	0.12806333	9'838	3.80%	0.00207054	8'031	2.11%	0.01415530	6'550	3.01%	0.00302243
14.04.2020	14'503	-0.49%	0.00052066	9'538	-3.09%	0.00144420	7'913	-1.48%	0.00044694	6'316	-3.64%	0.00090395
15.04.2020	15'050	3.70%	0.00002415	9'276	-2.78%	0.00095774	8'263	4.33%	0.00021910	6'125	-3.07%	0.00132343
16.04.2020	15'797	4.85%	0.00136674	9'155	-1.31%	0.00077377	8'469	2.46%	0.00187322	6'034	-1.50%	0.00094294
17.04.2020	15'603	-1.23%	0.00234860	9'279	1.35%	0.00017235	8'447	-0.26%	0.00060638	6'059	0.41%	0.00022406
20.04.2020	15'259	-2.23%	0.00015232	9'041	-2.60%	0.00018101	8'381	-0.78%	0.00000677	5'950	-1.82%	0.00001710
21.04.2020	13'581	-11.65%	0.00049658	8'223	-9.48%	0.00067812	8'053	-3.99%	0.00006153	5'822	-2.17%	0.00032955
22.04.2020	13'299	-2.10%	0.01357230	7'957	-3.29%	0.00899503	7'953	-1.25%	0.00159381	5'809	-0.22%	0.00047295
23.04.2020	13'326	0.20%	0.00044080	8'096	1.73%	0.00108309	7'981	0.35%	0.00015614	5'828	0.33%	0.00000500
24.04.2020	13'442	0.87%	0.00000402	8'182	1.06%	0.00030058	7'969	-0.15%	0.00001235	5'797	-0.53%	0.00001066
27.04.2020	12'906	-4.06%	0.00007493	8'061	-1.49%	0.00011204	7'850	-1.50%	0.00000226	5'753	-0.76%	0.00002844
28.04.2020	11'936	-7.82%	0.00165064	7'530	-6.81%	0.00022252	7'800	-0.64%	0.00022637	5'725	-0.49%	0.00005805
29.04.2020	11'853	-0.70%	0.00611455	7'363	-2.24%	0.00463692	7'767	-0.42%	0.00004083	5'703	-0.39%	0.00002380
30.04.2020	11'209	-5.58%	0.00004857	7'220	-1.96%	0.00050100	7'075	-9.33%	0.00001798	5'284	-7.63%	0.00001482
04.05.2020	12'058	7.29%	0.00311414	8'064	11.05%	0.00038442	6'328	-11.16%	0.00870798	5'241	-0.82%	0.00582306
05.05.2020	11'359	-5.97%	0.00532050	7'795	-3.39%	0.01221038	5'697	-10.50%	0.01245081	5'000	-4.71%	0.00006677
06.05.2020	10'188	-10.88%	0.00356240	7'436	-4.72%	0.00114760	5'153	-10.04%	0.01103435	4'831	-3.44%	0.00221600
07.05.2020	10'759	5.45%	0.01183935	7'525	1.20%	0.00223002	5'144	-0.17%	0.01007226	4'903	1.48%	0.00118229
11.05.2020	9'773	-9.61%	0.00297074	7'494	-0.42%	0.00014289	4'588	-11.44%	0.00000306	4'800	-2.12%	0.00021886
12.05.2020	9'414	-3.74%	0.00923987	7'305	-2.55%	0.00001745	4'147	-10.11%	0.01308434	4'709	-1.91%	0.00045077
13.05.2020	8'937	-5.20%	0.00139631	7'076	-3.19%	0.00065001	3'903	-6.06%	0.01021293	4'516	-4.18%	0.00036635
14.05.2020	9'336	4.37%	0.00270830	7'064	-0.17%	0.00101577	3'819	-2.18%	0.00367717	4'397	-2.67%	0.00175133
15.05.2020	9'703	3.85%	0.00191331	7'202	1.93%	0.00000283	3'906	2.25%	0.00047336	4'356	-0.94%	0.00071311
18.05.2020	10'700	9.78%	0.00148578	7'496	4.01%	0.00037223	4'113	5.16%	0.00050739	4'394	0.87%	0.00008776
19.05.2020	10'991	2.68%	0.00955959	7'505	0.12%	0.00160573	4'334	5.23%	0.00266657	4'356	-0.87%	0.00007544
20.05.2020	11'992	8.72%	0.00071965	7'960	5.88%	0.00000150	4'519	4.18%	0.00273929	4'434	1.77%	0.00007544
21.05.2020	11'982	-0.09%	0.00759970	8'288	4.04%	0.00345935	4'503	-0.35%	0.00174723	4'466	0.72%	0.00031499
22.05.2020	11'407	-4.92%	0.00000075	8'220	-0.83%	0.00163361	4'309	-4.40%	0.00001258	4'469	0.07%	0.00005171
26.05.2020	11'196	-1.87%	0.00241822	8'577	4.24%	0.00006818	4'225	-1.97%	0.00193934	4'509	0.89%	0.00000045
27.05.2020	10'512	-6.30%	0.00034892	8'690	1.31%	0.00180011	4'144	-1.94%	0.00038756	4'497	-0.27%	0.00007940
28.05.2020	10'173	-3.28%	0.00397305	8'484	-2.40%	0.00017286	4'113	-0.75%	0.00037472	4'497	0.00%	0.00000710
29.05.2020	10'392	2.14%	0.00107505	8'803	3.69%	0.00057651	6'041	38.44%	0.00005638	6'603	38.41%	0.00000000
01.06.2020	12'757	20.50%	0.00045668	8'755	-0.54%	0.00136147	6'694	10.26%	0.14777633	6'525	-1.19%	0.14754324

02.06.2020	14'606	13.53%	0.04204296	10'489	18.06%	0.00002942	7'266	8.20%	0.01053539	6'688	2.47%	0.00014121
03.06.2020	15'387	5.21%	0.01830466	10'578	0.85%	0.03263313	7'578	4.20%	0.00672307	6'463	-3.42%	0.00060880
04.06.2020	15'574	1.21%	0.00271478	10'074	-4.88%	0.00007150	8'294	9.03%	0.00176765	6'294	-2.65%	0.00117110
05.06.2020	16'922	8.30%	0.00014680	10'426	3.44%	0.00238522	9'531	13.90%	0.00815103	6'297	0.05%	0.00070208
08.06.2020	17'274	2.06%	0.00688517	10'151	-2.67%	0.00118009	9'531	0.00%	0.01932580	6'197	-1.60%	0.00000023
09.06.2020	17'161	-0.66%	0.00042404	9'923	-2.26%	0.00071469	9'488	-0.45%	0.00000000	6'069	-2.09%	0.00025626
10.06.2020	18'678	8.47%	0.00004324	10'235	3.09%	0.00051224	10'156	6.80%	0.00002045	6'431	5.79%	0.00043562
11.06.2020	19'908	6.38%	0.00717713	10'972	6.95%	0.00095282	10'491	3.25%	0.00462901	6'697	4.05%	0.00335660
12.06.2020	20'270	1.80%	0.00406915	11'214	2.19%	0.00483642	11'325	7.65%	0.00105320	6'863	2.45%	0.00164265
15.06.2020	20'874	2.93%	0.00032518	11'430	1.90%	0.00047938	11'694	3.21%	0.00585147	6'991	1.85%	0.00059952
16.06.2020	24'039	14.12%	0.00086137	12'865	11.83%	0.00036092	13'259	12.56%	0.00102805	7'384	5.47%	0.00034147
17.06.2020	26'479	9.67%	0.01992497	13'853	7.40%	0.01399861	14'650	9.98%	0.01577553	7'491	1.44%	0.00299120
18.06.2020	27'619	4.21%	0.00935206	14'172	2.27%	0.00547639	15'688	6.85%	0.00995281	7'578	1.15%	0.00020698
19.06.2020	26'186	-5.33%	0.00177476	13'653	-3.73%	0.00051665	15'566	-0.78%	0.00468619	7'547	-0.41%	0.00013333
22.06.2020	27'142	3.58%	0.00283645	13'727	0.54%	0.00138972	15'713	0.94%	0.00006095	7'594	0.62%	0.00001680
23.06.2020	29'565	8.55%	0.00128436	14'290	4.02%	0.00002883	16'294	3.63%	0.00008835	7'631	0.49%	0.00003854
24.06.2020	30'322	2.53%	0.00731166	13'932	-2.54%	0.00161691	16'453	0.97%	0.00131831	7'628	-0.04%	0.00002362
25.06.2020	29'489	-2.79%	0.00063972	13'574	-2.60%	0.00064394	16'522	0.42%	0.00009430	7'638	0.13%	0.00000015
26.06.2020	29'210	-0.95%	0.00077576	13'516	-0.43%	0.00067665	16'538	0.10%	0.00001751	7'638	0.00%	0.00000172
29.06.2020	30'694	4.96%	0.00009027	14'003	3.54%	0.00001827	16'681	0.86%	0.00000094	7'634	-0.05%	0.00000000
30.06.2020	30'513	-0.59%	0.00245546	13'803	-1.43%	0.00124998	24'819	39.73%	0.00007412	10'856	35.21%	0.00000027
01.07.2020	25'628	-17.45%	0.00003494	13'491	-2.29%	0.00020532	24'472	-1.41%	0.15787839	10'622	-2.18%	0.12397861
02.07.2020	27'123	5.67%	0.03044872	13'636	1.07%	0.00052423	27'491	11.63%	0.00019824	11'325	6.41%	0.00047483
03.07.2020	29'657	8.93%	0.00321435	15'205	10.89%	0.00011389	29'819	8.13%	0.01353245	12'594	10.62%	0.00410693
06.07.2020	31'621	6.41%	0.00797978	16'597	8.76%	0.01186043	30'844	3.38%	0.00660759	13'659	8.12%	0.01128011
07.07.2020	29'769	-6.04%	0.00411142	16'550	-0.29%	0.00768113	27'566	-11.24%	0.00114220	13'288	-2.75%	0.00658989
08.07.2020	26'758	-10.66%	0.00364269	16'098	-2.77%	0.00008022	26'703	-3.18%	0.01262457	13'503	1.61%	0.00075830
09.07.2020	27'068	1.15%	0.01136545	16'344	1.51%	0.00076453	26'728	0.09%	0.00101170	13'331	-1.28%	0.00025762
10.07.2020	27'822	2.75%	0.00013270	16'223	-0.74%	0.00022839	26'903	0.65%	0.00000088	13'206	-0.94%	0.00016435
13.07.2020	27'191	-2.29%	0.00075405	16'069	-0.95%	0.00005523	25'325	-6.04%	0.00004259	12'941	-2.03%	0.00008875
14.07.2020	25'397	-6.83%	0.00052622	15'665	-2.54%	0.00009076	24'356	-3.90%	0.00365369	12'400	-4.27%	0.00041090
15.07.2020	24'636	-3.04%	0.00465941	14'816	-5.57%	0.00064612	24'488	0.54%	0.00152208	11'884	-4.25%	0.00182364
16.07.2020	25'661	4.08%	0.00092546	14'488	-2.24%	0.00310745	25'922	5.69%	0.00002921	11'631	-2.15%	0.00180655
17.07.2020	27'046	5.26%	0.00166225	14'403	-0.59%	0.00050001	26'525	2.30%	0.00323861	11'538	-0.80%	0.00046307
20.07.2020	24'164	-11.26%	0.00276155	13'639	-5.45%	0.00003483	25'541	-3.78%	0.00052880	11'384	-1.34%	0.00006445
21.07.2020	22'371	-7.71%	0.01268938	13'175	-3.46%	0.00297271	24'522	-4.07%	0.00142904	11'281	-0.91%	0.00018055
22.07.2020	21'891	-2.17%	0.00594807	12'654	-4.03%	0.00119781	24'422	-0.41%	0.00165766	11'125	-1.39%	0.00008261
23.07.2020	21'712	-0.82%	0.00046996	12'333	-2.57%	0.00162632	24'172	-1.03%	0.00001670	11'006	-1.08%	0.00019391
24.07.2020	21'459	-1.17%	0.00006785	12'479	1.18%	0.00065945	24'066	-0.44%	0.00010587	11'009	0.03%	0.00011565
27.07.2020	22'159	3.21%	0.00013663	12'654	1.39%	0.00013820	24'378	1.29%	0.00001931	11'047	0.34%	0.00000007
28.07.2020	22'536	1.69%	0.00102862	13'166	3.97%	0.00019314	24'450	0.29%	0.00016592	11'084	0.33%	0.00001187
29.07.2020	24'535	8.50%	0.00028548	14'290	8.19%	0.00157412	24'506	0.23%	0.00000870	11'094	0.09%	0.00001118
30.07.2020	24'182	-1.45%	0.00722293	14'055	-1.66%	0.00671225	24'516	0.04%	0.00000523	11'088	-0.05%	0.00000081
31.07.2020	24'343	0.66%	0.00020972	14'609	3.87%	0.00027630	18'713	-27.01%	0.00000017	11'644	4.89%	0.00000029
03.08.2020	27'239	11.24%	0.00004352	15'453	5.62%	0.00149583	21'584	14.27%	0.07295806	11'978	2.83%	0.00239391
04.08.2020	28'202	3.47%	0.01264127	15'881	2.73%	0.00315601	21'400	-0.86%	0.02037295	12'397	3.44%	0.00079979
05.08.2020	27'053	-4.16%	0.00120710	16'223	2.13%	0.00074618	20'375	-4.91%	0.00007330	12'969	4.51%	0.00118218
06.08.2020	28'172	4.05%	0.00173147	16'584	2.20%	0.00045428	21'334	4.60%	0.00240907	13'041	0.55%	0.00203468
07.08.2020	27'335	-3.02%	0.00164388	16'268	-1.93%	0.00048495	19'819	-7.37%	0.00211539	13'088	0.36%	0.00003065
10.08.2020	27'388	0.19%	0.00090915	16'634	2.23%	0.00037132	20'066	1.24%	0.00542594	13'591	3.77%	0.00001294
11.08.2020	28'749	4.85%	0.00000371	17'154	3.08%	0.00049593	21'106	5.05%	0.00015341	14'088	3.59%	0.00142220
12.08.2020	29'409	2.27%	0.00235092	16'942	-1.24%	0.00094738	20'947	-0.76%	0.00255333	13'988	-0.71%	0.00128993
13.08.2020	29'181	-0.78%	0.00051519	16'583	-2.15%	0.00015424	20'906	-0.20%	0.00005718	13'784	-1.47%	0.00005074
14.08.2020	28'416	-2.66%	0.00006054	16'147	-2.66%	0.00046059	20'634	-1.31%	0.00000384	13'553	-1.69%	0.00021583
17.08.2020	28'559	0.50%	0.00070546	16'089	-0.36%	0.00070724	20'781	0.71%	0.00017151	13'453	-0.74%	0.00028563

18.08.2020	28'642	0.29%	0.00002507	16'092	0.02%	0.00001313	20'572	-1.01%	0.00005039	13'388	-0.48%	0.00005485
19.08.2020	27'759	-3.13%	0.00000845	15'683	-2.57%	0.00000003	20'081	-2.42%	0.00010218	13'163	-1.69%	0.00002346
20.08.2020	26'026	-6.45%	0.00098012	15'379	-1.96%	0.00066274	19'194	-4.52%	0.00058355	13'050	-0.86%	0.00028727
21.08.2020	25'053	-3.81%	0.00415486	16'145	4.86%	0.00038338	19'047	-0.77%	0.00204090	13'159	0.83%	0.00007433
24.08.2020	27'585	9.63%	0.00145308	16'845	4.24%	0.00236422	19'525	2.48%	0.00005911	13'250	0.69%	0.00006919
25.08.2020	28'729	4.06%	0.00927382	17'379	3.12%	0.00179920	19'594	0.35%	0.00061435	13'288	0.29%	0.00004749
26.08.2020	28'287	-1.55%	0.00165067	17'203	-1.02%	0.00097570	19'500	-0.48%	0.00001244	13'288	0.00%	0.00000820
27.08.2020	28'137	-0.53%	0.00024051	17'388	1.07%	0.00010365	19'433	-0.34%	0.00002313	13'278	-0.08%	0.00000000
28.08.2020	28'237	0.36%	0.00002836	17'031	-2.08%	0.00011404	21'559	10.38%	0.00001185	13'797	3.83%	0.00000057
01.09.2020	28'055	-0.65%	0.00001263	16'543	-2.90%	0.00043084	19'916	-7.93%	0.01077874	12'766	-7.77%	0.00147016
02.09.2020	26'961	-3.98%	0.00004178	15'878	-4.10%	0.00084304	19'022	-4.59%	0.00628372	12'172	-4.76%	0.00603197
03.09.2020	25'677	-4.88%	0.00158195	15'540	-2.15%	0.00168429	17'034	-11.04%	0.00210931	11'859	-2.61%	0.00227025
04.09.2020	25'258	-1.65%	0.00238261	15'722	1.16%	0.00046195	18'000	5.52%	0.01218482	12'094	1.96%	0.00067866
07.09.2020	25'611	1.39%	0.00027077	15'934	1.34%	0.00013511	17'381	-3.50%	0.00304267	12'272	1.46%	0.00038504
08.09.2020	24'500	-4.44%	0.00019352	15'428	-3.23%	0.00017930	16'619	-4.48%	0.00122459	11'878	-3.26%	0.00021347
09.09.2020	23'520	-4.08%	0.00196850	14'784	-4.26%	0.00104148	15'691	-5.75%	0.00200982	11'291	-5.07%	0.00106487
10.09.2020	22'681	-3.64%	0.00166473	15'074	1.94%	0.00181848	15'944	1.60%	0.00330157	11'403	0.99%	0.00256867
11.09.2020	25'166	10.40%	0.00132172	15'303	1.51%	0.00037774	16'734	4.84%	0.00255855	11'334	-0.61%	0.00009743
14.09.2020	26'390	4.75%	0.01081257	15'927	3.99%	0.00022745	17'300	3.33%	0.00233869	11'391	0.50%	0.00003684
15.09.2020	25'224	-4.52%	0.00225363	15'617	-1.97%	0.00159557	16'756	-3.20%	0.00110649	11'319	-0.63%	0.00002517
16.09.2020	24'652	-2.29%	0.00204195	15'583	-0.22%	0.00038617	16'525	-1.39%	0.00102081	11'259	-0.53%	0.00004021
17.09.2020	24'626	-0.10%	0.00052567	15'460	-0.79%	0.00000472	16'553	0.17%	0.00019271	11'231	-0.25%	0.00002825
18.09.2020	25'043	1.68%	0.00000109	15'704	1.57%	0.00006280	16'550	-0.02%	0.00000287	11'244	0.12%	0.00000620
21.09.2020	25'360	1.26%	0.00028135	15'333	-2.39%	0.00024512	16'513	-0.22%	0.00000003	11'213	-0.28%	0.00000134
22.09.2020	26'329	3.75%	0.00015861	15'162	-1.12%	0.00005126	16'944	2.58%	0.00000501	11'156	-0.51%	0.00000762
23.09.2020	28'130	6.62%	0.00140527	15'230	0.45%	0.00012627	17'684	4.27%	0.00066388	11'203	0.42%	0.00002597
24.09.2020	30'676	8.66%	0.00437678	15'601	2.41%	0.00002017	18'447	4.22%	0.00182726	11'178	-0.22%	0.00001767
25.09.2020	29'435	-4.13%	0.00750802	15'399	-1.30%	0.00058035	18'369	-0.42%	0.00178434	11'184	0.05%	0.00000499
28.09.2020	29'702	0.90%	0.00170429	15'203	-1.29%	0.00016963	18'166	-1.11%	0.00001795	11'163	-0.19%	0.00000029
29.09.2020	30'455	2.50%	0.00008162	14'895	-2.05%	0.00016518	18'094	-0.40%	0.00012349	11'153	-0.09%	0.00000353
30.09.2020	31'612	3.73%	0.00062645	14'677	-1.48%	0.00041894	25'203	33.14%	0.00001577	11'703	4.81%	0.00000080
01.10.2020	27'755	-13.01%	0.00139106	15'249	3.83%	0.00021774	26'681	5.70%	0.10981446	11'900	1.67%	0.00231714
02.10.2020	28'896	4.03%	0.01693255	15'621	2.41%	0.00146402	28'144	5.34%	0.00324771	12'672	6.29%	0.00027866
05.10.2020	28'903	0.02%	0.00162281	15'749	0.81%	0.00058204	28'553	1.44%	0.00284969	12'425	-1.97%	0.00395093
06.10.2020	28'411	-1.72%	0.00000006	15'690	-0.38%	0.00006636	28'244	-1.09%	0.00020816	12'316	-0.88%	0.00038747
07.10.2020	26'951	-5.28%	0.00029476	15'267	-2.73%	0.00001435	26'566	-6.12%	0.00011840	11'816	-4.14%	0.00007764
08.10.2020	26'387	-2.11%	0.00278415	14'902	-2.42%	0.00074561	26'513	-0.20%	0.00375142	11'950	1.13%	0.00171766
09.10.2020	26'099	-1.10%	0.00044680	15'183	1.87%	0.00058677	25'553	-3.69%	0.00000399	11'697	-2.14%	0.00012716
12.10.2020	25'215	-3.45%	0.00012066	15'046	-0.91%	0.00035065	25'500	-0.21%	0.00136017	11'691	-0.05%	0.00045791
13.10.2020	25'274	0.23%	0.00118690	14'644	-2.71%	0.00008205	26'078	2.24%	0.00000431	11'416	-2.38%	0.00000026
14.10.2020	24'755	-2.08%	0.00000547	13'904	-5.19%	0.00073394	24'691	-5.47%	0.00050237	10'944	-4.22%	0.00056660
15.10.2020	23'140	-6.75%	0.00043085	13'471	-3.17%	0.00269034	23'900	-3.26%	0.00298698	10'681	-2.43%	0.00178291
16.10.2020	22'162	-4.32%	0.00455079	13'221	-1.87%	0.00100226	23'644	-1.08%	0.00106018	10'700	0.18%	0.00059170
19.10.2020	21'581	-2.66%	0.00186458	13'101	-0.91%	0.00035041	23'234	-1.75%	0.00011597	10'728	0.26%	0.00000316
20.10.2020	22'253	3.07%	0.00070607	13'284	1.39%	0.00008265	23'678	1.89%	0.00030599	10'725	-0.03%	0.00000683
21.10.2020	23'159	3.99%	0.00094109	13'545	1.95%	0.00019224	24'084	1.70%	0.00035833	10'750	0.23%	0.00000008
22.10.2020	25'347	9.03%	0.00158952	13'819	2.00%	0.00037916	24'353	1.11%	0.00028905	10'750	0.00%	0.00000542
23.10.2020	24'080	-5.13%	0.00815437	14'044	1.62%	0.00039864	24'084	-1.11%	0.00012337	10'756	0.06%	0.00000000
26.10.2020	22'878	-5.12%	0.00262928	13'578	-3.38%	0.00026252	23'919	-0.69%	0.00012337	10'775	0.18%	0.00000031
27.10.2020	23'330	1.96%	0.00262190	13'409	-1.25%	0.00114239	23'916	-0.01%	0.00004726	10'766	-0.08%	0.00000311
28.10.2020	21'951	-6.10%	0.00038316	12'895	-3.91%	0.00015686	23'863	-0.22%	0.00000002	10'750	-0.15%	0.00000070
29.10.2020	20'540	-6.64%	0.00371737	12'575	-2.51%	0.00152553	23'759	-0.44%	0.00000492	10'734	-0.15%	0.00000221
30.10.2020	21'194	3.13%	0.00441230	12'581	0.05%	0.00063177	16'700	-35.26%	0.00001908	9'925	-7.84%	0.00000222
02.11.2020	21'825	2.94%	0.00098165	11'849	-5.99%	0.00000021	15'756	-5.82%	0.12429340	9'434	-5.07%	0.00614020
03.11.2020	19'628	-10.61%	0.00086254	11'882	0.27%	0.00358544	14'732	-6.72%	0.00338578	9'369	-0.69%	0.00257421

04.11.2020	19'808	0.91%	0.01126279	12'154	2.26%	0.00000751	15'153	2.82%	0.00451574	9'484	1.22%	0.00004780
05.11.2020	19'848	0.20%	0.00008357	12'390	1.93%	0.00051266	14'650	-3.38%	0.00079392	9'513	0.31%	0.00014884
06.11.2020	20'379	2.64%	0.00000400	12'324	-0.54%	0.00037101	15'625	6.44%	0.00113962	9'350	-1.73%	0.00000932
09.11.2020	21'297	4.41%	0.00069920	12'608	2.27%	0.00002865	16'038	2.61%	0.00415146	9'541	2.02%	0.00029870
10.11.2020	20'351	-4.55%	0.00194185	12'491	-0.93%	0.00051709	14'638	-9.13%	0.00068062	9'469	-0.76%	0.00040893
11.11.2020	19'109	-6.30%	0.00206754	12'210	-2.27%	0.00008695	13'344	-9.26%	0.00834300	9'319	-1.60%	0.00005738
12.11.2020	19'412	1.57%	0.00396286	12'469	2.10%	0.00051471	14'044	5.11%	0.00856625	9'622	3.20%	0.00025498
13.11.2020	19'264	-0.76%	0.00024705	12'644	1.40%	0.00043895	13'444	-4.37%	0.00261411	9'744	1.26%	0.00102380
16.11.2020	18'978	-1.50%	0.00005844	12'745	0.79%	0.00019476	12'850	-4.52%	0.00190640	9'688	-0.58%	0.00015875
17.11.2020	18'718	-1.38%	0.00022424	13'110	2.83%	0.00006238	12'713	-1.07%	0.00204205	9'994	3.11%	0.00003322
18.11.2020	18'907	1.00%	0.00018964	13'579	3.52%	0.00079818	13'025	2.42%	0.00011489	10'009	0.15%	0.00096702
19.11.2020	18'781	-0.67%	0.00010052	13'458	-0.90%	0.00123771	13'216	1.46%	0.00058784	10'056	0.47%	0.00000225
20.11.2020	19'439	3.44%	0.00004423	13'654	1.45%	0.00008065	13'250	0.26%	0.00021192	10'106	0.50%	0.00002195
23.11.2020	19'341	-0.51%	0.00118573	13'901	1.80%	0.00020927	13'203	-0.36%	0.00000660	10'141	0.35%	0.00002460
24.11.2020	19'012	-1.72%	0.00002581	13'862	-0.28%	0.00032220	13'134	-0.52%	0.00001263	10'144	0.03%	0.00001195
25.11.2020	19'582	2.95%	0.00029466	13'930	0.49%	0.00000785	13'144	0.08%	0.00002746	10'156	0.12%	0.00000009
26.11.2020	20'095	2.59%	0.00087251	14'013	0.59%	0.00002382	13'153	0.07%	0.00000058	10'166	0.10%	0.00000140
27.11.2020	19'360	-3.72%	0.00066952	13'894	-0.85%	0.00003539	13'144	-0.07%	0.00000047	10'154	-0.12%	0.00000097
30.11.2020	19'226	-0.70%	0.00138689	13'951	0.41%	0.00007231	12'666	-3.70%	0.00000047	10'675	5.00%	0.00000140
01.12.2020	19'216	-0.05%	0.00004879	11'000	-23.77%	0.00001669	12'556	-0.87%	0.00137227	10'409	-2.52%	0.00250369
02.12.2020	15'204	-23.42%	0.00000026	10'950	-0.46%	0.05650274	11'272	-10.79%	0.00007608	10'266	-1.38%	0.00063674
03.12.2020	15'304	0.66%	0.05484100	11'335	3.46%	0.00002085	11'250	-0.20%	0.01163742	10'444	1.72%	0.00019136
04.12.2020	16'553	7.85%	0.00004293	11'820	4.19%	0.00119675	11'834	5.06%	0.00000382	10'541	0.92%	0.00029550
07.12.2020	15'979	-3.53%	0.00615511	11'940	1.00%	0.00175779	10'975	-7.54%	0.00256123	10'697	1.47%	0.00008547
08.12.2020	15'653	-2.06%	0.00124457	12'331	3.22%	0.00010057	10'659	-2.92%	0.00567865	11'216	4.74%	0.00021582
09.12.2020	16'416	4.76%	0.00042641	12'749	3.34%	0.00103855	10'978	2.95%	0.00085354	11'309	0.83%	0.00224468
10.12.2020	16'694	1.68%	0.00226587	12'925	1.37%	0.00111292	11'797	7.20%	0.00086958	11'425	1.02%	0.00006819
11.12.2020	18'055	7.83%	0.00028313	12'861	-0.50%	0.00018877	12'169	3.10%	0.00517709	11'550	1.09%	0.00010414
14.12.2020	18'662	3.31%	0.00613845	13'126	2.04%	0.00002473	12'344	1.43%	0.00096388	11'678	1.10%	0.00011841
15.12.2020	19'218	2.94%	0.00109328	12'938	-1.44%	0.00041662	12'528	1.48%	0.00020387	11'434	-2.11%	0.00012147
16.12.2020	19'149	-0.36%	0.00086282	12'567	-2.91%	0.00020807	12'731	-1.61%	0.00021892	11'347	-0.76%	0.00044586
17.12.2020	19'399	1.29%	0.00001290	12'630	0.50%	0.00084890	13'000	2.09%	0.00025837	11'275	-0.64%	0.00005834
18.12.2020	20'074	3.42%	0.00016765	12'554	-0.61%	0.00002519	13'031	0.24%	0.00043720	11'266	-0.08%	0.00004052
21.12.2020	19'997	-0.39%	0.00117203	12'291	-2.12%	0.00003675	13'028	-0.02%	0.00000567	11'256	-0.09%	0.00000064
22.12.2020	20'281	1.41%	0.00001486	12'397	0.86%	0.00044811	13'031	0.02%	0.00000005	11'259	0.03%	0.00000079
23.12.2020	20'695	2.02%	0.00019836	12'564	1.34%	0.00007471	13'038	0.05%	0.00000005	11'256	-0.03%	0.00000007
24.12.2020	20'437	-1.25%	0.00040877	12'544	-0.17%	0.00017903	13'222	1.40%	0.00000029	8'973	-22.67%	0.00000007
29.12.2020	19'606	-4.15%	0.00015686	12'914	2.91%	0.00000275	12'050	-9.28%	0.00019639	9'144	1.89%	0.05138439
30.12.2020	20'383	3.88%	0.00172336	13'491	4.38%	0.00084522	12'791	5.97%	0.00861508	9'684	5.74%	0.00035637
04.01.2021	18'851	-7.81%	0.00150767	13'243	-1.86%	0.00191444	14'525	12.71%	0.00356136	10'644	9.45%	0.00329213
05.01.2021	19'510	3.43%	0.00609928	13'672	3.19%	0.00034529	15'009	3.28%	0.01616191	11'391	6.78%	0.00893428
06.01.2021	19'021	-2.54%	0.00117985	13'469	-1.50%	0.00101699	14'978	-0.21%	0.00107444	11'231	-1.41%	0.00460053
07.01.2021	19'920	4.62%	0.00064531	13'914	3.25%	0.00022480	17'228	14.00%	0.00000427	12'344	9.45%	0.00020010
08.01.2021	22'489	12.13%	0.00213539	15'144	8.47%	0.00105801	19'394	11.84%	0.01958698	12'919	4.55%	0.00892880
11.01.2021	25'134	11.12%	0.01470829	15'515	2.42%	0.00718207	23'263	18.19%	0.01402514	13'922	7.48%	0.00207289
12.01.2021	23'478	-6.82%	0.01236585	15'352	-1.05%	0.00058482	21'653	-7.17%	0.03308775	12'681	-9.34%	0.00559074
13.01.2021	21'617	-8.26%	0.00464731	14'444	-6.10%	0.00011112	21'094	-2.62%	0.00514377	12'006	-5.47%	0.00871712
14.01.2021	21'092	-2.46%	0.00681680	14'876	2.95%	0.00372268	21'381	1.35%	0.00068410	12'438	3.53%	0.00299190
15.01.2021	22'050	4.44%	0.00060428	15'402	3.48%	0.00086801	21'681	1.39%	0.00018263	12'913	3.75%	0.00124961
18.01.2021	21'538	-2.35%	0.00197287	15'257	-0.95%	0.00120974	21'772	0.42%	0.00019415	12'566	-2.72%	0.00140462
19.01.2021	22'273	3.36%	0.00055259	15'181	-0.50%	0.00008945	21'875	0.47%	0.00001754	12'656	0.71%	0.00074201
20.01.2021	22'982	3.13%	0.00112782	15'438	1.68%	0.00002522	22'709	3.74%	0.00002228	12'831	1.37%	0.00005093
21.01.2021	23'067	0.37%	0.00098006	16'175	4.66%	0.00028326	22'431	-1.23%	0.00140002	12'963	1.02%	0.00018859
22.01.2021	22'978	-0.39%	0.00001378	16'187	0.07%	0.00217375	22'213	-0.98%	0.00015172	12'966	0.02%	0.00010476
25.01.2021	21'030	-8.86%	0.00001502	15'764	-2.64%	0.00000050	21'994	-0.99%	0.00009538	12'944	-0.17%	0.00000005

26.01.2021	19'531	-7.40%	0.00784454	15'329	-2.80%	0.00069833	21'744	-1.14%	0.00009817	12'922	-0.17%	0.00000288
27.01.2021	19'491	-0.20%	0.00547431	15'653	2.09%	0.00078326	21'731	-0.06%	0.00013069	12'947	0.19%	0.00000289
28.01.2021	19'092	-2.07%	0.00000413	15'884	1.46%	0.00043572	21'680	-0.23%	0.00000036	12'950	0.02%	0.00000374
29.01.2021	19'565	2.45%	0.00042680	16'038	0.96%	0.00021451	12'288	-56.78%	0.00000552	12'359	-4.67%	0.00000005
01.02.2021	18'067	-7.97%	0.00059887	16'103	0.40%	0.00009309	11'300	-8.38%	0.32235937	12'444	0.69%	0.00218194
02.02.2021	17'366	-3.95%	0.00634937	15'905	-1.24%	0.00001629	8'819	-24.79%	0.00702587	11'928	-4.24%	0.00004698
03.02.2021	17'736	2.10%	0.00156344	16'290	2.39%	0.00015261	9'988	12.45%	0.06145155	12'544	5.04%	0.00179352
04.02.2021	17'513	-1.27%	0.00044282	16'654	2.21%	0.00057216	10'263	2.72%	0.01549425	12'719	1.39%	0.00253551
05.02.2021	17'800	1.63%	0.00016031	17'375	4.24%	0.00048750	10'588	3.12%	0.00073771	13'444	5.54%	0.00019195
08.02.2021	17'135	-3.81%	0.00026571	17'642	1.52%	0.00179813	9'734	-8.41%	0.00097195	13'391	-0.40%	0.00307315
09.02.2021	16'793	-2.02%	0.00144931	18'147	2.83%	0.00023195	9'969	2.39%	0.00707220	14'219	6.00%	0.00001560
10.02.2021	17'829	5.99%	0.00040856	19'150	5.37%	0.00079939	10'344	3.69%	0.00056908	14'588	2.56%	0.00359955
11.02.2021	18'097	1.50%	0.00358491	19'200	0.26%	0.00288905	10'788	4.20%	0.00136356	15'475	5.90%	0.00065639
12.02.2021	20'230	11.14%	0.00022369	20'778	7.90%	0.00000691	11'247	4.17%	0.00176633	15'916	2.81%	0.00348413
15.02.2021	20'826	2.90%	0.01241059	21'658	4.15%	0.00624093	11'706	4.00%	0.00173614	15'994	0.49%	0.00078956
16.02.2021	24'233	15.15%	0.00084200	25'214	15.20%	0.00172081	13'925	17.36%	0.00160001	17'266	7.65%	0.00002390
17.02.2021	27'113	11.23%	0.02295762	28'838	13.43%	0.02310500	14'956	7.14%	0.03013149	18'013	4.24%	0.00585617
18.02.2021	22'604	-18.19%	0.01261023	24'207	-17.51%	0.01803682	13'391	-11.05%	0.00510178	17'100	-5.20%	0.00179390
19.02.2021	21'591	-4.59%	0.03307645	22'311	-8.16%	0.03064286	13'284	-0.80%	0.01221682	16'906	-1.14%	0.00270559
22.02.2021	21'520	-0.33%	0.00210390	24'700	10.17%	0.00665183	13'116	-1.27%	0.00006436	16'850	-0.33%	0.00013019
23.02.2021	20'232	-6.17%	0.00001075	23'711	-4.09%	0.01034532	13'000	-0.89%	0.00016199	16'838	-0.07%	0.00001101
24.02.2021	19'503	-3.67%	0.00380914	22'469	-5.38%	0.00167068	12'903	-0.75%	0.00007892	16'763	-0.45%	0.00000051
25.02.2021	20'549	5.22%	0.00134543	21'475	-4.52%	0.00289353	12'866	-0.29%	0.00005609	16'750	-0.08%	0.00000193
26.02.2021	20'148	-1.97%	0.00272763	21'311	-0.77%	0.00204631	11'313	-12.86%	0.00000825	16'947	1.17%	0.00000060
01.03.2021	20'070	-0.39%	0.00038753	21'014	-1.40%	0.00005909	11'628	2.75%	0.01654713	16'803	-0.85%	0.00013672
02.03.2021	24'302	19.14%	0.00001539	22'542	7.02%	0.00019633	14'269	20.47%	0.00075424	19'759	16.21%	0.00007282
03.03.2021	24'697	1.61%	0.03661852	24'426	8.02%	0.00492883	14'309	0.28%	0.04189119	19'550	-1.06%	0.02626073
04.03.2021	25'812	4.42%	0.00025933	24'730	1.24%	0.00643743	14'453	1.00%	0.00000784	19'647	0.49%	0.00011308
05.03.2021	27'256	5.44%	0.00195002	25'136	1.63%	0.00015374	15'750	8.59%	0.00010027	19'800	0.78%	0.00002450
08.03.2021	28'198	3.40%	0.00296328	25'938	3.14%	0.00026480	15'881	0.83%	0.00738540	19'794	-0.03%	0.00006018
09.03.2021	29'399	4.17%	0.00115422	24'508	-5.67%	0.00098524	17'844	11.65%	0.00006861	19'081	-3.67%	0.00000009
10.03.2021	29'226	-0.59%	0.00174184	23'538	-4.04%	0.00321525	17'038	-4.62%	0.01358248	18'450	-3.36%	0.00134585
11.03.2021	29'487	0.89%	0.00003490	24'055	2.17%	0.00162906	16'622	-2.47%	0.00213640	18'775	1.75%	0.00113089
12.03.2021	29'068	-1.43%	0.00007881	25'473	5.73%	0.00047109	16'600	-0.13%	0.00061103	19'038	1.39%	0.00030492
15.03.2021	31'359	7.59%	0.00020456	26'234	2.94%	0.00328262	17'750	6.70%	0.00000175	19'328	1.51%	0.00019351
16.03.2021	30'855	-1.62%	0.00575612	26'611	1.43%	0.00086639	17'606	-0.81%	0.00448670	19'994	3.39%	0.00022855
17.03.2021	32'378	4.82%	0.00026251	29'378	9.89%	0.00020315	18'025	2.35%	0.00006635	21'119	5.47%	0.00114768
18.03.2021	33'275	2.73%	0.00232080	31'907	8.26%	0.00978492	17'925	-0.56%	0.00055319	21'769	3.03%	0.00299656
19.03.2021	33'361	0.26%	0.00074642	31'662	-0.77%	0.00682087	17'950	0.14%	0.00003095	22'294	2.38%	0.00091893
22.03.2021	33'255	-0.32%	0.00000674	31'129	-1.70%	0.00005927	17'750	-1.12%	0.00000194	22'281	-0.06%	0.00056790
23.03.2021	30'917	-7.29%	0.00001019	28'167	-10.00%	0.00028804	17'100	-3.73%	0.00012554	21'628	-2.97%	0.00000034
24.03.2021	28'754	-7.25%	0.00531572	27'299	-3.13%	0.01000283	16'906	-1.14%	0.00139182	21'447	-0.84%	0.00088480
25.03.2021	31'567	9.33%	0.00525862	29'534	7.87%	0.00097948	16'894	-0.07%	0.00013019	21'522	0.35%	0.00007063
26.03.2021	32'328	2.38%	0.00871006	29'848	1.06%	0.00619288	16'884	-0.06%	0.00000050	21'456	-0.31%	0.00000129
29.03.2021	30'681	-5.23%	0.00056784	28'081	-6.10%	0.00011214	16'919	0.21%	0.00000035	21'341	-0.54%	0.00000943
30.03.2021	30'018	-2.18%	0.00273479	26'275	-6.65%	0.00372388	16'916	-0.02%	0.00000429	21'319	-0.10%	0.00002888
31.03.2021	30'936	3.01%	0.00047678	25'167	-4.31%	0.00442174	21'953	26.06%	0.00000003	20'641	-3.23%	0.00000106
01.04.2021	34'823	11.84%	0.00090607	25'261	0.38%	0.00185676	23'022	4.75%	0.06793523	21'091	2.16%	0.00104454
06.04.2021	35'977	3.26%	0.01401047	24'625	-2.55%	0.00001413	24'372	5.70%	0.00226067	19'963	-5.50%	0.00046514
07.04.2021	36'131	0.43%	0.00106319	24'515	-0.44%	0.00065162	24'434	0.25%	0.00324725	18'475	-7.75%	0.00302124
08.04.2021	35'955	-0.49%	0.00001837	21'872	-11.41%	0.00001977	24'125	-1.27%	0.00000646	17'100	-7.73%	0.00600038
09.04.2021	37'275	3.61%	0.00002396	22'270	1.81%	0.01302239	25'900	7.10%	0.00016198	17'029	-0.42%	0.00598148
12.04.2021	39'301	5.29%	0.00129970	23'145	3.85%	0.00032661	27'586	6.31%	0.00504019	17'475	2.59%	0.00001731
13.04.2021	38'454	-2.18%	0.00280204	23'084	-0.26%	0.00148410	25'436	-8.11%	0.00397725	17'457	-0.10%	0.00066840
14.04.2021	38'931	1.23%	0.00047463	24'281	5.06%	0.00000696	27'429	7.54%	0.00658417	18'893	7.91%	0.00000106

15.04.2021	41'077	5.37%	0.00015166	27'212	11.40%	0.00255551	28'214	2.82%	0.00569049	19'557	3.45%	0.00624902
16.04.2021	41'229	0.37%	0.00287989	27'913	2.54%	0.01298897	28'107	-0.38%	0.00079623	19'596	0.20%	0.00119314
19.04.2021	41'873	1.55%	0.00001357	27'905	-0.03%	0.00064599	28'057	-0.18%	0.00001444	19'864	1.36%	0.00000397
20.04.2021	41'434	-1.05%	0.00024033	29'235	4.66%	0.00000008	28'150	0.33%	0.00000317	20'664	3.95%	0.00018451
21.04.2021	45'688	9.77%	0.00011095	30'587	4.52%	0.00216961	29'057	3.17%	0.00001095	20'957	1.41%	0.00155899
22.04.2021	44'635	-2.33%	0.00955039	29'227	-4.55%	0.00204362	28'721	-1.16%	0.00100565	20'539	-2.01%	0.00019824
23.04.2021	44'928	0.65%	0.00054302	28'135	-3.81%	0.00207058	28'929	0.72%	0.00013528	20'514	-0.12%	0.00040591
26.04.2021	46'461	3.35%	0.00004285	27'132	-3.63%	0.00144987	29'257	1.13%	0.00005207	20'343	-0.84%	0.00000148
27.04.2021	48'146	3.56%	0.00112547	28'498	4.91%	0.00131641	29'454	0.67%	0.00012711	20'493	0.73%	0.00007007
28.04.2021	49'697	3.17%	0.00126873	29'268	2.66%	0.00204333	29'600	0.49%	0.00004504	20'486	-0.03%	0.00005397
29.04.2021	50'225	1.06%	0.00100505	29'592	1.10%	0.00070978	29'693	0.31%	0.00002445	20'536	0.24%	0.00000012
30.04.2021	51'625	2.75%	0.00011179	30'133	1.81%	0.00012146	41'700	33.96%	0.00000984	24'689	18.42%	0.00000594
04.05.2021	52'904	2.45%	0.00075536	31'406	4.14%	0.00032774	45'071	7.77%	0.11532123	25'911	4.83%	0.03392167
05.05.2021	55'821	5.37%	0.00059936	31'936	1.67%	0.000171238	45'750	1.50%	0.00604318	25'779	-0.51%	0.00233384
06.05.2021	50'612	-9.80%	0.00287998	30'414	-4.88%	0.00027998	39'179	-15.51%	0.00022359	24'429	-5.38%	0.00002609
07.05.2021	52'360	3.39%	0.00959548	31'810	4.49%	0.00238314	41'607	6.01%	0.02404078	26'107	6.64%	0.00289328
10.05.2021	56'638	7.85%	0.00115250	33'372	4.79%	0.00201399	44'629	7.01%	0.00361532	26'457	1.33%	0.00441328
11.05.2021	52'964	-6.71%	0.00616922	32'366	-3.06%	0.00229844	40'150	-10.58%	0.00491618	25'993	-1.77%	0.00017735
12.05.2021	49'479	-6.80%	0.00449915	31'687	-2.12%	0.00093839	38'800	-3.42%	0.01118548	25'286	-2.76%	0.00031306
13.05.2021	48'449	-2.10%	0.00463041	30'842	-2.70%	0.00044884	38'068	-1.90%	0.00116979	24'950	-1.34%	0.00076046
14.05.2021	46'568	-3.96%	0.00044252	30'373	-1.53%	0.00073032	36'164	-5.13%	0.00036276	24'814	-0.55%	0.00017895
17.05.2021	45'276	-2.81%	0.00156952	29'668	-2.35%	0.00023544	34'943	-3.43%	0.00263270	24'496	-1.29%	0.00002988
18.05.2021	44'752	-1.16%	0.00079078	30'119	1.51%	0.00055045	35'821	2.48%	0.00117965	24'664	0.68%	0.00016636
19.05.2021	45'653	1.99%	0.00013545	31'356	4.02%	0.00022780	36'129	0.86%	0.00061584	25'114	1.81%	0.00004672
20.05.2021	47'428	3.81%	0.00039725	31'618	0.83%	0.00161796	36'482	0.97%	0.00007330	25'114	0.00%	0.00032691
21.05.2021	49'337	3.95%	0.00145447	32'104	1.52%	0.00006948	36'914	1.18%	0.00009454	25'104	-0.04%	0.00000000
24.05.2021	47'748	-3.27%	0.00155699	31'236	-2.74%	0.00023242	36'371	-1.48%	0.00013858	24'950	-0.62%	0.00000016
25.05.2021	45'595	-4.61%	0.00107161	29'919	-4.31%	0.00075060	36'143	-0.63%	0.00021961	24'764	-0.75%	0.00003786
26.05.2021	43'485	-4.74%	0.00212948	29'926	0.02%	0.00185572	35'993	-0.42%	0.00003954	24'696	-0.27%	0.00005599
27.05.2021	41'954	-3.58%	0.00224458	29'601	-1.09%	0.00000005	35'818	-0.49%	0.00001730	24'650	-0.19%	0.00000756
28.05.2021	39'828	-5.20%	0.00128477	29'629	0.09%	0.00011919	28'161	-24.05%	0.00002376	24'346	-1.24%	0.00000348
01.06.2021	47'504	17.63%	0.00270514	32'165	8.21%	0.00000089	29'429	4.40%	0.05784627	24'818	1.92%	0.00015399
02.06.2021	44'706	-6.07%	0.03106869	31'862	-0.95%	0.00674439	26'000	-12.39%	0.00193975	24'929	0.45%	0.00036870
03.06.2021	42'369	-5.37%	0.00368638	31'784	-0.24%	0.00008986	24'600	-5.54%	0.01534726	25'000	0.28%	0.00001991
04.06.2021	41'495	-2.09%	0.00288283	32'406	1.94%	0.00000592	24'714	0.46%	0.00306363	25'907	3.56%	0.00000809
07.06.2021	41'619	0.30%	0.00043477	32'171	-0.73%	0.00037596	22'529	-9.26%	0.00002138	25'239	-2.61%	0.00127002
08.06.2021	40'941	-1.64%	0.00000902	32'784	1.89%	0.00005314	22'739	0.93%	0.00856856	25'829	2.31%	0.00068240
09.06.2021	44'323	7.94%	0.00027011	34'624	5.46%	0.00035631	25'571	11.74%	0.00008608	27'575	6.54%	0.00053396
10.06.2021	49'306	10.65%	0.00630104	37'663	8.41%	0.00298087	28'143	9.58%	0.01377745	28'400	2.95%	0.00427869
11.06.2021	51'373	4.11%	0.01135043	38'795	2.96%	0.00707954	29'786	5.67%	0.00918526	28'932	1.86%	0.00086905
14.06.2021	50'909	-0.91%	0.00168543	37'967	-2.16%	0.00087743	28'821	-3.29%	0.00321941	28'421	-1.78%	0.00034444
15.06.2021	52'127	2.36%	0.00008222	39'157	3.09%	0.00046539	30'279	4.94%	0.00108466	29'032	2.13%	0.00031755
16.06.2021	54'377	4.23%	0.00055903	40'867	4.27%	0.00095194	30'854	1.88%	0.00243543	29'507	1.62%	0.00045243
17.06.2021	54'382	0.01%	0.00178614	39'661	-3.00%	0.00182597	30'479	-1.22%	0.00035389	28'861	-2.21%	0.00026338
18.06.2021	49'521	-9.36%	0.00000001	37'680	-5.12%	0.00089740	28'907	-5.30%	0.00014954	28'782	-0.27%	0.00049002
21.06.2021	47'457	-4.26%	0.00876965	36'672	-2.71%	0.00262359	28'250	-2.30%	0.00280414	28'482	-1.05%	0.00000751
22.06.2021	48'647	2.48%	0.00181152	37'048	1.02%	0.00073557	28'107	-0.51%	0.00052855	28'232	-0.88%	0.00010979
23.06.2021	49'628	2.00%	0.00061304	39'245	5.76%	0.00010391	28'304	0.70%	0.00002575	28'279	0.17%	0.00007773
24.06.2021	50'205	1.16%	0.00039831	40'341	2.75%	0.00332043	28'321	0.06%	0.00004878	28'343	0.23%	0.00000277
25.06.2021	51'718	2.97%	0.00013368	42'323	4.79%	0.00075872	28'493	0.61%	0.00000036	28'461	0.42%	0.00000511
28.06.2021	50'533	-2.32%	0.00088150	42'325	0.00%	0.00229848	28'446	-0.17%	0.00003666	28'482	0.07%	0.00001726
29.06.2021	49'859	-1.34%	0.00053711	42'387	0.15%	0.00000000	28'500	0.19%	0.00000273	28'507	0.09%	0.00000054
30.06.2021	48'411	-2.95%	0.00018052	43'073	1.61%	0.00000217	35'836	22.90%	0.00000360	37'639	27.79%	0.00000077
01.07.2021	50'243	3.71%	0.00086816	42'300	-1.81%	0.00025779	31'754	-12.09%	0.05246339	36'525	-3.00%	0.07722345
02.07.2021	48'784	-2.95%	0.00137930	40'965	-3.21%	0.00032779	31'393	-1.14%	0.01462510	35'357	-3.25%	0.00090263

05.07.2021	46'685	-4.40%	0.00086789	38'090	-7.28%	0.00102875	27'607	-12.85%	0.00013073	32'668	-7.91%	0.00105629
06.07.2021	44'398	-5.02%	0.00193423	38'412	0.84%	0.00529524	29'607	6.99%	0.01651625	34'036	4.10%	0.00625687
07.07.2021	48'442	8.72%	0.00252250	41'134	6.85%	0.00007095	32'321	8.77%	0.00489181	35'250	3.50%	0.00168287
08.07.2021	48'599	0.32%	0.00759710	39'774	-3.36%	0.00468622	32'464	0.44%	0.00769240	34'675	-1.64%	0.00122827
09.07.2021	48'943	0.71%	0.00001049	39'838	0.16%	0.00112944	32'893	1.31%	0.00001949	35'386	2.03%	0.00027049
12.07.2021	47'726	-2.52%	0.00004990	37'307	-6.56%	0.00000253	31'443	-4.51%	0.00017235	33'907	-4.27%	0.00041198
13.07.2021	44'669	-6.62%	0.00063460	36'335	-2.64%	0.00430616	30'121	-4.30%	0.00203252	33'550	-1.06%	0.00182284
15.07.2021	45'849	2.61%	0.00438274	35'112	-3.42%	0.00069782	30'321	0.66%	0.00184503	33'036	-1.54%	0.00011203
16.07.2021	45'940	0.20%	0.00068065	35'779	1.88%	0.00117258	29'939	-1.27%	0.00004380	32'929	-0.32%	0.00023836
19.07.2021	47'696	3.75%	0.00000388	38'124	6.35%	0.00035488	30'396	1.51%	0.00016075	33'129	0.61%	0.00001052
20.07.2021	46'159	-3.27%	0.00140728	38'214	0.24%	0.00402850	30'161	-0.78%	0.00022949	33'150	0.06%	0.00003667
21.07.2021	47'470	2.80%	0.00107207	38'600	1.00%	0.00000560	30'264	0.34%	0.00006024	33'254	0.31%	0.00000040
22.07.2021	47'884	0.87%	0.00078418	38'650	0.13%	0.00010098	30'436	0.57%	0.00001162	33'204	-0.15%	0.00000981
23.07.2021	48'776	1.85%	0.00007544	38'328	-0.84%	0.00000168	30'561	0.41%	0.00003212	33'125	-0.24%	0.00000226
26.07.2021	47'522	-2.61%	0.00034065	36'481	-4.94%	0.00006999	30'429	-0.43%	0.00001680	32'918	-0.63%	0.00000567
27.07.2021	45'932	-3.40%	0.00067887	34'797	-4.73%	0.00243988	30'236	-0.64%	0.00001874	32'918	0.00%	0.00003930
28.07.2021	47'961	4.32%	0.00115768	34'665	-0.38%	0.00223453	30'250	0.05%	0.00004049	32'914	-0.01%	0.00000000
29.07.2021	49'703	3.57%	0.00186809	35'617	2.71%	0.00001447	30'336	0.28%	0.00000021	32'918	0.00%	0.00000001
30.07.2021	49'593	-0.22%	0.00127312	36'046	1.20%	0.00073493	37'321	20.72%	0.00000806	30'050	-9.12%	0.00000001
02.08.2021	51'402	3.58%	0.00000489	38'162	5.70%	0.00014342	37'018	-0.82%	0.04294056	31'143	3.57%	0.00830959
03.08.2021	51'786	0.74%	0.00128292	39'014	2.21%	0.00325331	36'921	-0.26%	0.00006645	31'507	1.16%	0.00127641
04.08.2021	52'293	0.97%	0.00005531	40'071	2.67%	0.00048736	38'700	4.71%	0.00006688	31'986	1.51%	0.00013503
05.08.2021	52'641	0.66%	0.00009497	39'579	-1.24%	0.00071539	38'339	-0.94%	0.00221456	30'904	-3.44%	0.00022766
06.08.2021	52'428	-0.41%	0.00004412	38'263	-3.38%	0.00015277	37'646	-1.82%	0.00008783	30'914	0.03%	0.00118423
09.08.2021	51'942	-0.93%	0.00001647	38'235	-0.07%	0.00114450	38'157	1.35%	0.00033273	30'139	-2.54%	0.00000010
10.08.2021	52'719	1.49%	0.00008683	39'152	2.37%	0.00000052	37'950	-0.54%	0.00018178	31'054	2.99%	0.00064461
11.08.2021	54'259	2.88%	0.00022079	40'266	2.81%	0.00056144	38'629	1.77%	0.00002959	31'900	2.69%	0.00089447
12.08.2021	56'083	3.31%	0.00082872	39'998	-0.67%	0.00078765	39'168	1.39%	0.00031449	31'707	-0.61%	0.00072245
13.08.2021	55'901	-0.32%	0.00109355	39'983	-0.04%	0.00004472	39'586	1.06%	0.00019201	31'500	-0.65%	0.00003683
16.08.2021	57'230	2.35%	0.00001056	40'625	1.59%	0.00000014	40'464	2.19%	0.00011269	31'161	-1.08%	0.00004290
17.08.2021	57'896	1.16%	0.00055180	41'273	1.58%	0.00025402	41'450	2.41%	0.00048124	31'279	0.38%	0.00011708
18.08.2021	59'513	2.75%	0.00013399	42'332	2.53%	0.00025054	41'786	0.81%	0.00057961	31'379	0.32%	0.00001429
19.08.2021	58'236	-2.17%	0.00075866	41'098	-2.96%	0.00064115	41'893	0.26%	0.00006518	31'257	-0.39%	0.00001019
20.08.2021	59'260	1.74%	0.00047055	41'699	1.45%	0.00087527	42'286	0.93%	0.00000654	31'261	0.01%	0.00001518
23.08.2021	60'154	1.50%	0.00030367	42'557	2.04%	0.00021102	42'914	1.47%	0.00008719	31'332	0.23%	0.00000002
24.08.2021	59'629	-0.88%	0.00022417	43'098	1.26%	0.00041479	42'907	-0.02%	0.00021733	31'423	0.29%	0.00000515
25.08.2021	57'908	-2.93%	0.00007687	42'216	-2.07%	0.00015954	42'529	-0.88%	0.00000003	31'304	-0.38%	0.00000841
26.08.2021	59'303	2.38%	0.00085767	42'731	1.21%	0.00042754	42'568	0.09%	0.00007830	31'339	0.11%	0.00001440
27.08.2021	60'240	1.57%	0.00056689	42'020	-1.68%	0.00014683	42'532	-0.08%	0.00000084	31'332	-0.02%	0.00000125
31.08.2021	57'127	-5.30%	0.00024559	40'109	-4.65%	0.00028087	42'893	0.85%	0.00000072	33'054	5.35%	0.00000005
01.09.2021	53'494	-6.57%	0.00281420	40'884	1.91%	0.00216683	41'875	-2.40%	0.00007143	32'568	-1.48%	0.00286253
02.09.2021	55'269	3.27%	0.00431887	41'041	0.38%	0.00036598	43'714	4.30%	0.00057694	31'954	-1.90%	0.00021941
03.09.2021	53'098	-4.01%	0.00106607	39'963	-2.66%	0.00001473	40'929	-6.58%	0.00184723	31'686	-0.84%	0.00036225
06.09.2021	50'907	-4.21%	0.00160600	38'437	-3.89%	0.00070857	39'264	-4.15%	0.00433353	30'321	-4.40%	0.00007094
07.09.2021	51'918	1.97%	0.00177544	38'947	1.32%	0.00151567	40'714	3.63%	0.00172481	30'889	1.86%	0.00193903
08.09.2021	52'200	0.54%	0.00038621	40'069	2.84%	0.00017352	40'614	-0.25%	0.00131507	31'621	2.34%	0.00034446
09.09.2021	54'821	4.90%	0.00002941	41'323	3.08%	0.00080685	43'586	7.06%	0.00006055	32'471	2.65%	0.00054856
10.09.2021	58'268	6.10%	0.00240045	41'950	1.51%	0.00094904	46'143	5.70%	0.00498763	32'686	0.66%	0.00070362
13.09.2021	60'011	2.95%	0.00371779	42'207	0.61%	0.00022702	49'321	6.66%	0.00325006	32'725	0.12%	0.00004355
14.09.2021	57'999	-3.41%	0.00086934	40'715	-3.60%	0.00003724	48'354	-1.98%	0.00443618	32'439	-0.88%	0.00000142
15.09.2021	57'620	-0.66%	0.00116353	41'392	1.65%	0.00129394	47'857	-1.03%	0.00039208	32'686	0.76%	0.00007705
16.09.2021	58'151	0.92%	0.00004294	42'540	2.73%	0.00027162	48'321	0.96%	0.00010674	33'064	1.15%	0.00005754
17.09.2021	58'546	0.68%	0.00008418	43'046	1.18%	0.00074784	48'996	1.39%	0.00009310	33'225	0.49%	0.00013221
20.09.2021	57'395	-1.99%	0.00004589	40'638	-5.76%	0.00013989	48'507	-1.00%	0.00019244	32'754	-1.43%	0.00002360
21.09.2021	59'518	3.63%	0.00039445	42'514	4.51%	0.00331428	51'136	5.28%	0.00010061	32'979	0.68%	0.00020385

22.09.2021	60'308	1.32%	0.00131896	42'562	0.11%	0.00203755	51'500	0.71%	0.00278580	32'714	-0.81%	0.00004687
23.09.2021	62'333	3.30%	0.00017401	42'752	0.44%	0.00000128	52'443	1.81%	0.00050531	32'793	0.24%	0.00006509
24.09.2021	63'773	2.28%	0.00109094	42'585	-0.39%	0.00001976	52'507	0.12%	0.00032924	32'846	0.16%	0.00000582
27.09.2021	67'556	5.76%	0.00052136	43'111	1.23%	0.00001535	53'236	1.38%	0.00000149	32'918	0.22%	0.00000261
28.09.2021	71'392	5.52%	0.00332094	44'273	2.66%	0.00015072	54'021	1.46%	0.00019012	32'936	0.05%	0.00000479
29.09.2021	75'578	5.70%	0.00305053	43'173	-2.52%	0.00070812	54'257	0.44%	0.00021427	32'918	-0.05%	0.00000030
30.09.2021	73'392	-2.93%	0.00324580	42'789	-0.89%	0.00063333	61'750	12.94%	0.00001900	36'196	9.49%	0.00000030
01.10.2021	65'261	-11.74%	0.00086124	43'442	1.51%	0.00007956	64'875	4.94%	0.01673452	36'621	1.17%	0.00901151
04.10.2021	66'462	1.82%	0.01378607	43'935	1.13%	0.00022918	68'143	4.91%	0.00243724	36'243	-1.04%	0.00013626
05.10.2021	72'446	8.62%	0.00033212	45'971	4.53%	0.00012714	75'786	10.63%	0.00241534	37'168	2.52%	0.00010765
06.10.2021	76'451	5.38%	0.00743449	46'406	0.94%	0.00205193	77'657	2.44%	0.01130078	36'464	-1.91%	0.00063514
07.10.2021	73'381	-4.10%	0.00289527	44'546	-4.09%	0.00008869	73'807	-5.08%	0.00059478	35'518	-2.63%	0.00036568
08.10.2021	67'815	-7.89%	0.00167997	43'805	-1.68%	0.00167353	74'929	1.51%	0.00258553	35'611	0.26%	0.00069095
11.10.2021	71'791	5.70%	0.00622166	45'131	2.98%	0.00028090	76'464	2.03%	0.00022763	35'825	0.60%	0.00000684
12.10.2021	68'334	-4.94%	0.00324557	44'686	-0.99%	0.00088839	70'464	-8.17%	0.00041124	35'793	-0.09%	0.00003590
13.10.2021	63'577	-7.22%	0.00243629	44'775	0.20%	0.00009786	68'857	-2.31%	0.00667785	35'711	-0.23%	0.00000080
14.10.2021	63'074	-0.79%	0.00520625	45'534	1.68%	0.00000396	69'179	0.47%	0.00053223	35'711	0.00%	0.00000526
15.10.2021	58'895	-6.86%	0.00006291	44'004	-3.42%	0.00028245	66'107	-4.54%	0.00021177	35'421	-0.82%	0.00000000
18.10.2021	57'946	-1.62%	0.00469933	44'908	2.03%	0.00116894	66'768	0.99%	0.00206322	35'518	0.27%	0.00006649
19.10.2021	62'568	7.67%	0.00026396	45'620	1.57%	0.00041393	68'750	2.93%	0.00009899	35'629	0.31%	0.00000748
20.10.2021	63'282	1.13%	0.00588829	46'006	0.84%	0.00024764	68'464	-0.42%	0.00085573	35'568	-0.17%	0.00000974
21.10.2021	57'148	-10.19%	0.00012869	44'910	-2.41%	0.00007077	65'832	-3.92%	0.00001738	35'354	-0.60%	0.00000294
22.10.2021	54'600	-4.56%	0.01039309	43'331	-3.58%	0.00058104	65'418	-0.63%	0.00153680	35'114	-0.68%	0.00003642
22.10.2021	54'600	0.00%	0.00208124	43'331	0.00%	0.00128154	65'418	0.00%	0.00003980	35'114	0.00%	0.00004640
25.10.2021	49'254	-10.30%	0.00000000	42'440	-2.08%	0.00000000	65'050	-0.56%	0.00000000	35'279	0.47%	0.00000000
26.10.2021	43'514	-12.39%	0.01061511	39'669	-6.75%	0.00043135	64'907	-0.22%	0.00003182	35'182	-0.28%	0.00002198
27.10.2021	44'234	1.64%	0.01535592	39'022	-1.65%	0.00455999	64'821	-0.13%	0.00000484	35'093	-0.25%	0.00000758
28.10.2021	46'447	4.88%	0.00026968	39'633	1.55%	0.00027064	64'786	-0.05%	0.00000176	35'046	-0.13%	0.00000642
29.10.2021	46'859	0.88%	0.00238329	40'546	2.28%	0.00024180	33'443	-66.12%	0.00000029	34'379	-1.92%	0.00000180
01.11.2021	44'234	-5.76%	0.00007782	35'838	-12.34%	0.00051844	27'643	-19.05%	0.43724764	30'250	-12.79%	0.00036924
02.11.2021	38'687	-13.40%	0.00332231	31'627	-12.50%	0.01523649	25'143	-9.48%	0.03627881	27'307	-10.24%	0.01637113
03.11.2021	35'467	-8.69%	0.01795359	28'699	-9.71%	0.01562106	23'571	-6.46%	0.00898571	24'557	-10.61%	0.01047616
04.11.2021	37'709	6.13%	0.00755112	30'404	5.77%	0.00943745	25'964	9.67%	0.00416830	25'854	5.15%	0.01126700
05.11.2021	37'610	-0.26%	0.00375630	30'881	1.56%	0.00332824	26'679	2.72%	0.00934969	25'300	-2.17%	0.00264899
08.11.2021	39'147	4.00%	0.00000692	31'900	3.25%	0.00024280	28'579	6.88%	0.00073798	27'264	7.48%	0.00046920
09.11.2021	38'992	-0.40%	0.00160366	32'355	1.41%	0.00105467	27'321	-4.50%	0.00473281	26'479	-2.92%	0.00558947
10.11.2021	38'095	-2.33%	0.00001568	30'036	-7.44%	0.00019983	27'929	2.20%	0.00202649	25'179	-5.03%	0.00085353
11.11.2021	37'639	-1.20%	0.00054134	29'070	-3.27%	0.00553071	28'021	0.33%	0.00048444	24'593	-2.35%	0.00253428
12.11.2021	37'866	0.60%	0.00014503	27'962	-3.89%	0.00106868	29'036	3.56%	0.00001082	24'750	0.64%	0.00055453
15.11.2021	37'621	-0.65%	0.00003607	27'784	-0.64%	0.00151051	28'679	-1.24%	0.00126609	24'357	-1.60%	0.00004050
16.11.2021	34'735	-7.98%	0.00004212	26'174	-5.97%	0.00004078	27'393	-4.59%	0.00015305	23'843	-2.13%	0.00025620
17.11.2021	36'203	4.14%	0.00637277	25'221	-3.71%	0.00356239	27'464	0.26%	0.00210476	23'314	-2.24%	0.00045491
18.11.2021	39'561	8.87%	0.00171332	26'520	5.02%	0.00137578	29'125	5.87%	0.00000670	23'293	-0.09%	0.00050340
19.11.2021	44'154	10.98%	0.00787095	28'225	6.23%	0.00252158	29'682	1.89%	0.00344814	23'575	1.20%	0.00000081
23.11.2021	43'355	-1.83%	0.01206576	28'128	-0.34%	0.00388521	30'093	1.38%	0.00035887	23'650	0.32%	0.00014482
24.11.2021	42'329	-2.39%	0.00033391	29'337	4.21%	0.00001179	30'104	0.04%	0.00018911	23'886	0.99%	0.00001009
24.11.2021	42'329	0.00%	0.00057306	29'337	0.00%	0.00176881	30'104	0.00%	0.00000013	23'886	0.00%	0.00009859
24.11.2021	42'329	0.00%	0.00000000	29'337	0.00%	0.00000000	30'104	0.00%	0.00000000	23'886	0.00%	0.00000000
25.11.2021	42'981	1.53%	0.00000000	31'420	6.86%	0.00000000	30'214	0.36%	0.00000000	24'064	0.74%	0.00000000
26.11.2021	44'164	2.72%	0.00023313	30'797	-2.00%	0.00470600	30'257	0.14%	0.00001330	24'086	0.09%	0.00005512
29.11.2021	47'385	7.04%	0.00073747	30'700	-0.31%	0.00040098	30'493	0.78%	0.00000202	24'132	0.19%	0.00000084
30.11.2021	50'371	6.11%	0.00495525	32'277	5.01%	0.00000986	34'357	11.93%	0.00006037	23'750	-1.60%	0.00000364
01.12.2021	50'604	0.46%	0.00373451	32'394	0.36%	0.00250920	33'679	-1.99%	0.01423455	26'068	9.31%	0.00025460
02.12.2021	40'313	-22.74%	0.00002134	32'261	-0.41%	0.00001300	35'014	3.89%	0.00039726	26'579	1.94%	0.00867245
03.12.2021	41'527	2.97%	0.05168915	33'821	4.72%	0.00001690	35'250	0.67%	0.00151115	28'054	5.40%	0.00037686

06.12.2021	43'316	4.22%	0.00087980	34'328	1.49%	0.00223090	36'607	3.78%	0.00004513	27'289	-2.76%	0.00291706
07.12.2021	45'471	4.86%	0.00177886	33'094	-3.66%	0.00022092	39'536	7.70%	0.00142687	26'661	-2.33%	0.00076439
08.12.2021	44'178	-2.89%	0.00235848	31'863	-3.79%	0.00133970	39'429	-0.27%	0.00592472	25'546	-4.27%	0.00054205
09.12.2021	39'799	-10.44%	0.00083283	30'483	-4.43%	0.00143629	36'821	-6.84%	0.00000734	25'504	-0.16%	0.00182509
10.12.2021	41'501	4.19%	0.01089469	30'427	-0.18%	0.00196131	37'271	1.21%	0.00468311	25'321	-0.72%	0.00000271
13.12.2021	41'027	-1.15%	0.00175280	30'909	1.57%	0.00000334	37'179	-0.25%	0.00147555	25'279	-0.17%	0.00005186
14.12.2021	38'216	-7.10%	0.00013176	29'325	-5.26%	0.00024720	32'750	-12.68%	0.00000611	24'568	-2.85%	0.00000276
15.12.2021	36'106	-5.68%	0.00503803	27'978	-4.70%	0.00276760	31'786	-2.99%	0.01608867	24'400	-0.69%	0.00081392
16.12.2021	38'482	6.37%	0.00322648	29'241	4.42%	0.00221308	31'861	0.24%	0.00089264	24'168	-0.96%	0.00004708
17.12.2021	34'341	-11.39%	0.00406311	27'506	-6.12%	0.00195014	31'679	-0.57%	0.00000555	23'825	-1.43%	0.00009127
20.12.2021	36'444	5.95%	0.01296432	27'896	1.41%	0.00374005	31'993	0.99%	0.00003282	23'839	0.06%	0.00020432
21.12.2021	36'615	0.47%	0.00353532	30'325	8.35%	0.00019760	31'911	-0.26%	0.00009728	23'864	0.10%	0.00000035
22.12.2021	35'058	-4.34%	0.00002182	30'802	1.56%	0.00696955	31'879	-0.10%	0.00000659	23'946	0.34%	0.00000110
23.12.2021	34'402	-1.89%	0.00188736	30'992	0.62%	0.00024428	31'800	-0.25%	0.00000101	24'013	0.28%	0.00001177
24.12.2021	34'411	0.03%	0.00035766	30'997	0.02%	0.00003786	19'179	-50.57%	0.00000616	23'675	-1.42%	0.00000781
29.12.2021	36'870	6.90%	0.00000008	33'564	7.96%	0.00000002	20'179	5.08%	0.25568229	25'114	5.90%	0.00020095
30.12.2021	38'975	5.55%	0.00476171	34'238	1.99%	0.00633127	22'107	9.13%	0.00258334	26'011	3.51%	0.00348169
31.12.2021	38'975	0.00%	0.00308362	34'238	0.00%	0.00039430	22'957	3.77%	0.00832690	25'950	-0.23%	0.00123159
04.01.2022	34'894	-11.06%	0.00000000	33'557	-2.01%	0.00000000	19'964	-13.97%	0.00142345	24'336	-6.42%	0.00000551
05.01.2022	35'375	1.37%	0.01223593	33'511	-0.14%	0.00040327	17'543	-12.93%	0.01951392	24'343	0.03%	0.00412355
06.01.2022	34'977	-1.13%	0.00018753	32'230	-3.90%	0.00000188	18'136	3.32%	0.01671219	23'189	-4.86%	0.00000008
07.01.2022	35'629	1.85%	0.00012818	32'515	0.88%	0.00151944	18'929	4.28%	0.00110516	23'039	-0.65%	0.00235869
10.01.2022	33'053	-7.50%	0.00034196	30'268	-7.16%	0.00007746	16'800	-11.93%	0.00183152	21'901	-5.07%	0.00004211
11.01.2022	31'945	-3.41%	0.00563239	30'467	0.65%	0.00512599	16'857	0.34%	0.01423637	21'889	-0.05%	0.00256604
12.01.2022	31'050	-2.84%	0.00116210	30'322	-0.48%	0.00004277	15'857	-6.12%	0.00001147	21'254	-2.94%	0.00000030
13.01.2022	30'354	-2.27%	0.00080822	28'930	-4.70%	0.00002282	15'321	-3.44%	0.00373993	20'086	-5.65%	0.00086666
14.01.2022	30'777	1.38%	0.00051421	29'130	0.69%	0.00220721	14'939	-2.52%	0.00118244	20'589	2.47%	0.00319474
17.01.2022	30'768	-0.03%	0.00019154	28'433	-2.42%	0.00004770	14'714	-1.52%	0.00063752	20'375	-1.04%	0.00061177
18.01.2022	30'160	-2.00%	0.00000009	26'703	-6.28%	0.00058740	13'786	-6.51%	0.00023031	20'100	-1.36%	0.00010917
19.01.2022	28'480	-5.73%	0.00039862	25'884	-3.11%	0.00394113	13'364	-3.11%	0.00424398	19'843	-1.29%	0.00018466
20.01.2022	29'477	3.44%	0.00328473	27'605	6.43%	0.00096910	13'104	-1.96%	0.00096653	20'164	1.60%	0.00016560
21.01.2022	29'368	-0.37%	0.00118530	27'633	0.10%	0.00414032	12'746	-2.77%	0.00038600	20'071	-0.46%	0.00025752
24.01.2022	29'203	-0.56%	0.00001384	27'551	-0.30%	0.00000105	12'793	0.37%	0.00076729	20'143	0.36%	0.00002137
25.01.2022	28'578	-2.16%	0.00003155	26'866	-2.51%	0.00000888	12'614	-1.41%	0.00001355	19'954	-0.94%	0.00001282
26.01.2022	28'802	0.78%	0.00046862	26'460	-1.52%	0.00063240	12'514	-0.80%	0.00019855	19'886	-0.34%	0.00008887
27.01.2022	29'828	3.50%	0.00006077	26'483	0.09%	0.00023207	12'557	0.34%	0.00006335	19'836	-0.25%	0.00001165
28.01.2022	31'443	5.27%	0.00122652	27'859	5.07%	0.00000074	12'664	0.85%	0.00001177	19'861	0.13%	0.00000634
31.01.2022	31'595	0.48%	0.00277912	27'312	-1.99%	0.00256689	13'161	3.85%	0.00007200	17'882	-10.50%	0.00000159
01.02.2022	37'154	16.21%	0.00002333	31'070	12.89%	0.00039448	12'768	-3.03%	0.00148183	17'218	-3.78%	0.01101731
02.02.2022	38'443	3.41%	0.02627013	31'706	2.03%	0.01662131	13'136	2.84%	0.00091905	17'293	0.43%	0.00143181
03.02.2022	39'640	3.07%	0.00116240	31'630	-0.24%	0.00041162	13'014	-0.93%	0.00080738	16'829	-2.72%	0.00001889
04.02.2022	37'935	-4.40%	0.00094060	32'388	2.37%	0.00000581	11'771	-10.04%	0.00008706	17'471	3.74%	0.00073974
04.02.2022	37'935	0.00%	0.00193355	32'388	0.00%	0.00056134	11'771	0.00%	0.01007751	17'471	0.00%	0.00140166
04.02.2022	37'935	0.00%	0.00000000	32'388	0.00%	0.00000000	11'771	0.00%	0.00000000	17'471	0.00%	0.00000000
07.02.2022	37'309	-1.66%	0.00000000	33'817	4.32%	0.00000000	10'771	-8.88%	0.00000000	18'021	3.10%	0.00000000
08.02.2022	39'058	4.58%	0.00027690	34'839	2.98%	0.00186277	11'389	5.58%	0.00788216	18'871	4.61%	0.00096071
09.02.2022	39'906	2.15%	0.00209984	35'316	1.36%	0.00088684	14'057	21.05%	0.00311260	19'364	2.58%	0.00212416
10.02.2022	42'343	5.93%	0.00046142	36'168	2.38%	0.00018457	14'732	4.69%	0.04429868	20'086	3.66%	0.00066509
11.02.2022	40'618	-4.16%	0.00351264	35'765	-1.12%	0.00056872	14'000	-5.10%	0.00219975	20'057	-0.14%	0.00134010
14.02.2022	38'629	-5.02%	0.00173087	34'065	-4.87%	0.00012539	12'950	-7.80%	0.00259740	19'650	-2.05%	0.00000209
15.02.2022	37'217	-3.72%	0.00252074	33'462	-1.79%	0.00237149	12'486	-3.65%	0.00607800	19'204	-2.30%	0.00042029
16.02.2022	36'106	-3.03%	0.00138607	33'806	1.02%	0.00031881	12'018	-3.82%	0.00133136	18'750	-2.39%	0.00052710
17.02.2022	36'739	1.74%	0.00091848	33'535	-0.81%	0.00010461	12'964	7.58%	0.00145943	18'636	-0.61%	0.00057240
18.02.2022	38'765	5.37%	0.00030216	34'409	2.57%	0.00006523	13'164	1.53%	0.00574121	18'679	0.23%	0.00003719
21.02.2022	39'250	1.24%	0.00288158	35'357	2.72%	0.00066277	13'468	2.28%	0.00023438	18'793	0.61%	0.00000531

22.02.2022	39'183	-0.17%	0.00015443	35'114	-0.69%	0.00073845	13'596	0.95%	0.00052124	18'864	0.38%	0.00003702
23.02.2022	41'082	4.73%	0.00000294	35'987	2.46%	0.00004761	13'750	1.13%	0.00008948	19'014	0.79%	0.00001422
24.02.2022	36'361	-12.21%	0.00224122	33'488	-7.20%	0.00060349	13'379	-2.74%	0.00012686	18'921	-0.49%	0.00006273
25.02.2022	35'041	-3.70%	0.01490446	32'532	-2.90%	0.00518061	13'311	-0.51%	0.00074816	18'911	-0.05%	0.00002404
28.02.2022	32'882	-6.36%	0.00136782	31'456	-3.36%	0.00083815	15'700	16.51%	0.00002596	22'675	18.15%	0.00000028
01.03.2022	39'397	18.08%	0.00404345	33'617	6.65%	0.00113211	19'071	19.45%	0.02724809	24'586	8.09%	0.03294923
02.03.2022	40'474	2.70%	0.03267544	34'323	2.08%	0.00441642	18'793	-1.47%	0.03783342	24'268	-1.30%	0.00654710
03.03.2022	39'438	-2.59%	0.00072774	34'969	1.86%	0.00043151	17'468	-7.31%	0.00021563	25'121	3.45%	0.00016948
04.03.2022	38'293	-2.94%	0.00067277	35'814	2.39%	0.00034752	18'425	5.33%	0.00534563	26'493	5.32%	0.00119339
07.03.2022	39'919	4.16%	0.00086718	36'772	2.64%	0.00056983	19'464	5.49%	0.00284492	27'964	5.40%	0.00282773
08.03.2022	41'817	4.65%	0.00172811	38'571	4.78%	0.00069716	19'750	1.46%	0.00300942	28'043	0.28%	0.00292004
09.03.2022	44'311	5.79%	0.00215887	40'886	5.83%	0.00228208	21'207	7.12%	0.00021278	28'511	1.66%	0.00000796
10.03.2022	45'681	3.05%	0.00335447	39'166	-4.30%	0.00339803	21'929	3.35%	0.00506628	27'093	-5.10%	0.00027393
11.03.2022	45'619	-0.14%	0.00092763	39'135	-0.08%	0.00184787	21'639	-1.33%	0.00112082	26'821	-1.01%	0.00260249
14.03.2022	43'630	-4.46%	0.00000186	34'921	-11.39%	0.00000063	20'729	-4.30%	0.00017723	25'218	-6.16%	0.00010181
15.03.2022	43'401	-0.53%	0.00198686	33'527	-4.07%	0.01297913	20'164	-2.76%	0.00184587	24'375	-3.40%	0.00379790
16.03.2022	43'493	0.21%	0.00002775	35'255	5.03%	0.00165857	20'161	-0.01%	0.00076368	25'089	2.89%	0.00115600
17.03.2022	45'328	4.13%	0.00000451	36'601	3.74%	0.00252606	20'354	0.95%	0.00000002	25'536	1.77%	0.00083356
17.03.2022	45'328	0.00%	0.00170856	36'601	0.00%	0.00140224	20'354	0.00%	0.00009077	25'536	0.00%	0.00031187
18.03.2022	45'059	-0.60%	0.00000000	36'466	-0.37%	0.00000000	20'396	0.21%	0.00000000	25'711	0.68%	0.00000000
18.03.2022	44'105	-2.14%	0.00003566	37'235	2.09%	0.00001364	20'396	0.00%	0.00000425	25'711	0.00%	0.00004664
21.03.2022	43'173	-2.14%	0.00045774	37'158	-0.21%	0.00043564	20'157	-1.18%	0.00000000	25'736	0.10%	0.00000000
21.03.2022	43'173	0.00%	0.00045628	37'158	0.00%	0.00000424	20'157	0.00%	0.00013894	25'736	0.00%	0.00000094
22.03.2022	41'450	-4.07%	0.00000000	37'476	0.85%	0.00000000	18'529	-8.42%	0.00000000	25'957	0.86%	0.00000000
23.03.2022	40'772	-1.65%	0.00165864	37'799	0.86%	0.00007240	18'446	-0.45%	0.00709209	26'200	0.93%	0.00007311
24.03.2022	40'412	-0.89%	0.00027205	37'482	-0.84%	0.00007364	18'161	-1.56%	0.00002016	26'107	-0.36%	0.00008683
25.03.2022	38'807	-4.05%	0.00007850	36'394	-2.95%	0.00007085	18'093	-2.95%	0.00024246	26'100	-0.03%	0.00001264
28.03.2022	37'429	-3.62%	0.00164218	35'529	-2.41%	0.00086845	17'764	-1.84%	0.00001407	26'171	0.27%	0.00000007
29.03.2022	38'078	1.72%	0.00130729	35'656	0.36%	0.00057868	17'714	-0.28%	0.00033677	26'179	0.03%	0.00000738
30.03.2022	38'460	1.00%	0.00029553	35'706	0.14%	0.00001273	17'643	-0.40%	0.00000794	26'139	-0.15%	0.00000009
31.03.2022	38'117	-0.90%	0.00009958	35'217	-1.38%	0.00000204	21'714	20.76%	0.00001613	26'736	2.26%	0.00000234
01.04.2022	45'922	18.63%	0.00008032	35'942	2.04%	0.00019021	21'036	-3.17%	0.04310528	26'768	0.12%	0.00050997
04.04.2022	44'206	-3.81%	0.03470234	35'908	-0.09%	0.00041469	18'914	-10.63%	0.00100628	25'854	-3.47%	0.00000143
05.04.2022	41'654	-5.95%	0.00145016	34'122	-5.10%	0.00000087	18'179	-3.96%	0.01130668	25'411	-1.73%	0.00120699
06.04.2022	40'751	-2.19%	0.00353608	33'337	-2.33%	0.00260435	18'829	-7.72%	0.00157096	23'936	-5.98%	0.00029871
07.04.2022	40'583	-0.41%	0.00047991	33'951	1.83%	0.00054211	17'079	1.47%	0.00595420	25'146	4.93%	0.00357587
08.04.2022	40'810	0.56%	0.00001711	35'182	3.56%	0.00033350	17'500	2.44%	0.00021745	25'836	2.71%	0.00243199
11.04.2022	38'978	-4.59%	0.00003120	34'594	-1.68%	0.00126885	15'393	-12.83%	0.00059298	25'029	-3.17%	0.00073279
12.04.2022	39'325	0.89%	0.00211051	35'784	3.38%	0.00028379	15'454	0.40%	0.01645782	25'832	3.16%	0.00100703
13.04.2022	39'102	-0.57%	0.00007867	35'665	-0.33%	0.00114216	15'086	-2.41%	0.00001564	25'636	-0.76%	0.00099723
14.04.2022	40'453	3.40%	0.00003241	36'750	3.00%	0.00001102	15'586	3.26%	0.00058084	26'021	1.49%	0.00005801
19.04.2022	38'757	-4.28%	0.00115452	36'969	0.59%	0.00089765	13'943	-11.14%	0.00106315	26'071	0.19%	0.00022220
20.04.2022	38'926	0.44%	0.00183573	35'940	-2.82%	0.00003536	12'804	-8.52%	0.01240895	25'532	-2.09%	0.00000369
21.04.2022	41'738	6.97%	0.00001901	36'038	0.27%	0.00079659	14'379	11.60%	0.00726244	25'586	0.21%	0.00043643
22.04.2022	44'216	5.77%	0.00486432	36'958	2.52%	0.00000748	14'721	2.35%	0.01345860	25'593	0.03%	0.00000446
25.04.2022	42'483	-4.00%	0.00332719	34'795	-6.03%	0.00063429	14'229	-3.40%	0.00055254	25'271	-1.27%	0.00000007
26.04.2022	41'190	-3.09%	0.00159926	33'503	-3.79%	0.00363433	14'204	-0.18%	0.00115552	25'218	-0.21%	0.00016031
27.04.2022	40'760	-1.05%	0.00095511	34'063	1.66%	0.00143382	14'229	0.18%	0.00000309	25'275	0.23%	0.00000441
28.04.2022	40'415	-0.85%	0.00011001	34'667	1.76%	0.00027539	14'186	-0.30%	0.00000309	25'225	-0.20%	0.00000510
29.04.2022	41'305	2.18%	0.00007233	35'065	1.14%	0.00030833	24'589	55.00%	0.00000916	26'454	4.76%	0.00000392
03.05.2022	50'041	19.19%	0.00047398	36'772	4.75%	0.00013081	25'250	2.65%	0.00254799	26'661	0.78%	0.00226308
04.05.2022	52'266	4.35%	0.03680951	37'260	1.32%	0.00225791	27'964	10.21%	0.00070368	27'879	4.47%	0.00006075
05.05.2022	54'672	4.50%	0.00189322	38'259	2.65%	0.00017395	29'250	4.50%	0.01042274	28'232	1.26%	0.00199558
06.05.2022	55'203	0.97%	0.00202478	38'289	0.08%	0.00069974	29'321	0.24%	0.00202155	28'082	-0.53%	0.00015832
09.05.2022	55'040	-0.30%	0.00009368	38'325	0.09%	0.00000063	29'571	0.85%	0.00000588	28'536	1.60%	0.00002838

10.05.2022	54'534	-0.92%	0.00000880	37'722	-1.58%	0.00000087	30'500	3.09%	0.00007208	27'250	-4.61%	0.00025721
11.05.2022	54'144	-0.72%	0.00008530	37'410	-0.83%	0.00025109	32'021	4.87%	0.00095682	27'407	0.57%	0.00212640
12.05.2022	55'450	2.38%	0.00005149	36'305	-3.00%	0.00006896	31'589	-1.36%	0.00236831	27'329	-0.29%	0.00003300
13.05.2022	53'168	-4.20%	0.00056854	36'132	-0.48%	0.00090015	30'864	-2.32%	0.00018450	27'200	-0.47%	0.00000812
16.05.2022	53'957	1.47%	0.00176656	36'140	0.02%	0.00002272	31'021	0.51%	0.00053910	27'246	0.17%	0.00002239
17.05.2022	57'069	5.61%	0.00021674	37'805	4.50%	0.00000005	32'125	3.50%	0.00002574	28'043	2.88%	0.00000286
18.05.2022	58'560	2.58%	0.00314536	38'376	1.50%	0.00202936	33'304	3.60%	0.00122291	28'486	1.57%	0.00083130
19.05.2022	58'018	-0.93%	0.00066529	37'249	-2.98%	0.00022439	32'768	-1.62%	0.00129910	28'211	-0.97%	0.00024566
20.05.2022	57'315	-1.22%	0.00008643	36'771	-1.29%	0.00088841	32'232	-1.65%	0.00026325	28'446	0.83%	0.00009410
23.05.2022	56'805	-0.89%	0.00014886	36'732	-0.11%	0.00016632	31'807	-1.33%	0.00027201	27'989	-1.62%	0.00006882
24.05.2022	53'470	-6.05%	0.00007987	35'768	-2.66%	0.00000115	31'107	-2.23%	0.00017618	27'761	-0.82%	0.00026231
25.05.2022	51'133	-4.47%	0.00366072	35'109	-1.86%	0.00070728	30'893	-0.69%	0.00049522	27'679	-0.30%	0.00006690
26.05.2022	49'994	-2.25%	0.00199607	35'444	0.95%	0.00034545	30'179	-2.34%	0.00004765	27'571	-0.39%	0.00000875
27.05.2022	47'189	-5.78%	0.00050755	35'199	-0.69%	0.00009015	29'286	-3.00%	0.00054678	27'443	-0.47%	0.00001528
30.05.2022	44'547	-5.76%	0.00333556	34'445	-2.17%	0.00004823	29'014	-0.93%	0.00090221	27'461	0.07%	0.00002165
31.05.2022	46'602	4.51%	0.00332011	35'345	2.58%	0.00046901	29'279	0.91%	0.00008707	26'682	-2.88%	0.00000043
01.06.2022	52'402	11.73%	0.00203547	36'503	3.22%	0.00066504	29'914	2.15%	0.00008267	25'900	-2.97%	0.00082815
06.06.2022	51'587	-1.57%	0.01375769	36'159	-0.95%	0.00103995	27'786	-7.38%	0.00046036	25'864	-0.14%	0.00088484
07.06.2022	48'860	-5.43%	0.00024575	34'442	-4.87%	0.00008941	25'014	-10.51%	0.00544560	24'407	-5.80%	0.00000193
	20'190'516			14'968'077			13'710'692			11'338'314		

## Appendix C

### Carbon Emissions Futures Dec22 06.01.2020-07.06.2022

Source: Investing.com, <https://www.investing.com/commodities/carbon-emissions-historical-data>

Date	Price	Open	High	Low	Vol.	Change %
06.01.2020	24.74	24.95	24.96	24.7	0.02K	-0.0298
07.01.2020	25.06	24.59	24.85	24.59	0.02K	0.0129
08.01.2020	24.6	24.88	24.88	24.57	0.51K	-0.0184
09.01.2020	25.2	24.84	25.2	24.84	0.12K	0.0244
10.01.2020	24.73	24.82	24.82	24.71	0.06K	-0.0187
13.01.2020	24.66	24.55	24.73	24.55	0.11K	-0.0028
14.01.2020	24.37	24.28	24.33	24.2	0.06K	-0.0118
15.01.2020	25.04	24.95	25.08	24.82	1.20K	0.0275
16.01.2020	25.37	25.44	25.44	25.12	0.12K	0.0132
17.01.2020	25.97	25.46	25.81	25.46	0.05K	0.0236
20.01.2020	25.7	25.81	26.1	25.7	0.57K	-0.0104
21.01.2020	25.45	25.55	25.95	25.42	0.15K	-0.0097
22.01.2020	25.55	25.82	26.08	25.52	0.19K	0.0039
23.01.2020	25.21	25.34	25.34	24.88	2.48K	-0.0133
24.01.2020	24.87	25.33	25.33	24.8	0.46K	-0.0135
27.01.2020	25.05	24.7	24.88	24.6	0.08K	0.0072
28.01.2020	25.1	25.05	25.05	25.05	0.01K	0.002
29.01.2020	24.43	24.88	24.88	24.44	0.56K	-0.0267
30.01.2020	24.17	24.3	24.34	23.9	4.25K	-0.0106
31.01.2020	24.31	24.13	24.13	23.95	2.09K	0.0058
03.02.2020	23.63	24.15	24.15	23.42	0.29K	-0.028
04.02.2020	23.78	23.69	23.87	23.35	1.49K	0.0063
05.02.2020	24.19	23.49	24.26	23.49	0.66K	0.0172
06.02.2020	23.98	24	24	23.63	0.08K	-0.0087
07.02.2020	23.75	23.83	24.01	23.7	0.52K	-0.0096
10.02.2020	23.58	23.71	23.71	23.39	0.11K	-0.0072
11.02.2020	23.74	23.72	24.03	23.59	0.05K	0.0068
12.02.2020	24.31	24	24.22	24	0.08K	0.024
13.02.2020	24.82	24.23	24.84	24.13	0.16K	0.021
14.02.2020	24.71	25.02	25.02	24.62	0.21K	-0.0044
17.02.2020	25.47	24.64	25.23	24.64	0.09K	0.0308
18.02.2020	25.56	25.32	25.64	25.25	0.36K	0.0035
19.02.2020	26.13	25.71	25.91	25.5	0.12K	0.0223
20.02.2020	26.06	26	26.11	25.96	0.13K	-0.0027
21.02.2020	26.03	25.89	25.94	25.85	0.53K	-0.0012
24.02.2020	25	25.51	25.51	24.87	0.26K	-0.0396
25.02.2020	24.62	24.99	25	24.62	0.13K	-0.0152
26.02.2020	24.69	24.5	24.76	24.21	0.24K	0.0028
27.02.2020	24.02	24.35	24.37	23.94	0.44K	-0.0271
28.02.2020	24.02	23.61	24.01	23.61	0.46K	0
02.03.2020	23.93	24.42	24.51	23.82	1.62K	-0.0037
03.03.2020	23.77	23.82	24.14	23.71	0.28K	-0.0067

04.03.2020	24.24	23.74	24.37	23.74	3.46K	0.0198
05.03.2020	24.21	24.28	24.28	24.28	0.20K	-0.0012
06.03.2020	23.83	23.91	24	23.85	0.30K	-0.0157
09.03.2020	23.68	23.57	23.57	22.9	2.46K	-0.0063
10.03.2020	24.5	23.75	24.39	23.75	0.12K	0.0346
11.03.2020	24.34	24.35	24.35	24	0.31K	-0.0065
12.03.2020	22.96	24.23	24.23	22.95	0.59K	-0.0567
13.03.2020	22.38	23.34	23.34	22.4	0.04K	-0.0253
16.03.2020	19.98	22	22	19.67	0.43K	-0.1072
17.03.2020	19.05	20.4	20.4	18.74	6.94K	-0.0465
18.03.2020	16.12	18.12	18.12	16.01	6.83K	-0.1538
19.03.2020	17.19	16.9	17.4	16.23	2.98K	0.0664
20.03.2020	16.84	17.42	17.69	16.81	2.69K	-0.0204
23.03.2020	16.28	15.6	16.38	15.15	1.17K	-0.0333
24.03.2020	17.5	16.91	17.85	16.7	8.75K	0.0749
25.03.2020	18.21	17.6	18.29	16.87	1.08K	0.0406
26.03.2020	18.06	17.52	18.29	17.31	0.32K	-0.0082
27.03.2020	17.11	17.38	17.57	17.09	0.53K	-0.0526
30.03.2020	17.78	17.22	18	17.22	0.14K	0.0392
31.03.2020	18.42	18.21	18.7	18.17	0.14K	0.036
01.04.2020	17.84	17.95	17.96	17.66	0.17K	-0.0315
02.04.2020	18.82	18.28	18.68	18	0.19K	0.0549
03.04.2020	18.73	18.9	19.12	18.78	0.07K	-0.0048
06.04.2020	21.17	19.2	21.11	19.2	0.42K	0.1303
07.04.2020	21.3	21.67	22.45	21.21	0.63K	0.0061
08.04.2020	21.93	21.3	21.91	20.87	0.26K	0.0296
09.04.2020	21.86	22.22	22.49	21.82	0.16K	-0.0032
14.04.2020	20.57	21.22	21.33	20.53	0.35K	-0.059
15.04.2020	20.02	20.34	20.45	19.74	2.80K	-0.0267
16.04.2020	21.69	20.45	21.86	20.45	1.19K	0.0834
17.04.2020	22.48	23	23	22.11	0.19K	0.0364
20.04.2020	22.15	22.2	22.28	21.84	0.35K	-0.0147
21.04.2020	20.64	21.41	21.48	20.68	0.74K	-0.0682
22.04.2020	21.45	20.41	22.03	20.28	4.09K	0.0392
23.04.2020	21.82	21.23	21.85	21.23	0.54K	0.0172
24.04.2020	21.53	21.5	21.91	21.38	0.10K	-0.0133
27.04.2020	21.09	21.74	21.74	20.75	0.16K	-0.0204
28.04.2020	21.04	20.93	21.5	20.82	0.88K	-0.0024
29.04.2020	21	21.29	21.4	20.86	1.17K	-0.0019
30.04.2020	20.39	21.22	21.22	20.09	0.47K	-0.029
01.05.2020	19.8	19.9	19.98	19.85	0.69K	-2.89%
04.05.2020	20.18	19.81	20.11	19.61	0.13K	1.92%
05.05.2020	19.92	20.4	20.5	19.7	0.31K	-1.29%
06.05.2020	19.83	19.71	20	19.59	1.45K	-0.45%
07.05.2020	20.35	19.7	20.4	19.7	0.72K	2.62%
08.05.2020	20.17	20.44	20.45	20.02	0.08K	-0.88%
11.05.2020	19.86	19.88	19.94	19.74	1.07K	-1.54%
12.05.2020	19.31	19.63	19.88	19.3	0.62K	-2.77%
13.05.2020	19.46	19.28	19.59	19.2	0.33K	0.78%

14.05.2020	19.62	19.28	19.64	19.26	0.13K	0.82%
15.05.2020	19.96	20	20	19.85	1.12K	1.73%
18.05.2020	21.14	20.3	21.16	20.2	1.75K	5.91%
19.05.2020	20.76	21	21.1	20.75	4.54K	-1.80%
20.05.2020	22.06	20.99	22.07	20.98	0.69K	6.26%
21.05.2020	21.97	22.27	22.27	21.93	0.12K	-0.41%
22.05.2020	22.19	21.65	22.17	21.39	1.19K	1.00%
25.05.2020	22.38	22.24	22.39	22.08	0.07K	0.86%
26.05.2020	22.4	22.36	22.95	22.21	1.84K	0.09%
27.05.2020	22.13	22.23	22.23	22.05	2.07K	-1.21%
28.05.2020	22.04	22.01	22.06	21.7	0.86K	-0.41%
29.05.2020	22.18	22.24	22.6	22.13	0.49K	0.64%
01.06.2020	21.75	22.07	22.07	21.74	0.10K	-1.94%
02.06.2020	22.84	22.06	22.86	22.06	1.18K	5.01%
03.06.2020	22.85	22.82	22.82	22.46	0.58K	0.04%
04.06.2020	22.98	22.72	22.87	22.59	0.16K	0.57%
05.06.2020	24.02	22.94	23.91	22.8	0.50K	4.53%
08.06.2020	23.48	23.52	23.63	23.47	0.17K	-2.25%
09.06.2020	23.24	23.32	23.37	23.11	0.49K	-1.02%
10.06.2020	23.68	23.06	23.23	23.02	0.16K	1.89%
11.06.2020	23.04	23.14	23.15	23.02	0.11K	-2.70%
12.06.2020	22.78	22.9	22.9	22.66	0.22K	-1.13%
15.06.2020	22.93	22.44	22.95	22.43	0.35K	0.66%
16.06.2020	23.55	23.49	24	23.49	0.19K	2.70%
17.06.2020	23.52	23.61	23.66	23.23	0.38K	-0.13%
18.06.2020	25.23	23.54	25.13	23.5	0.53K	7.27%
19.06.2020	24.92	25.04	25.3	24.83	0.09K	-1.23%
22.06.2020	25.28	24.56	25.34	24.56	0.95K	1.44%
23.06.2020	26.15	25.29	26.2	25.28	1.45K	3.44%
24.06.2020	26.14	25.8	26.42	25.55	0.32K	-0.04%
25.06.2020	25.92	25.9	26.08	25.58	1.22K	-0.84%
26.06.2020	25.46	25.98	26.12	25.66	0.64K	-1.77%
29.06.2020	27.35	25.59	27.17	25.5	0.42K	7.42%
30.06.2020	27.68	27.15	27.9	26.89	0.91K	1.21%
01.07.2020	28.42	27.55	28.8	27.47	0.42K	2.67%
02.07.2020	28.09	28.05	28.57	28.03	1.28K	-1.16%
03.07.2020	28.64	27.6	28.63	27.57	0.47K	1.96%
06.07.2020	30.43	29.45	30.32	29.45	0.14K	6.25%
07.07.2020	30.12	30.25	30.52	30	0.20K	-1.02%
08.07.2020	30.06	29.5	29.56	29.05	0.63K	-0.20%
09.07.2020	29.37	30.03	30.03	29.16	0.31K	-2.30%
10.07.2020	29.78	28.96	29.01	28.61	0.15K	1.40%
13.07.2020	30.14	30.11	31.35	29.99	1.79K	1.21%
14.07.2020	30.46	30.2	30.45	29.7	0.56K	1.06%
15.07.2020	29.7	30.92	31.24	29.84	0.68K	-2.50%
16.07.2020	27.67	29.75	30.2	27.8	5.69K	-6.84%
17.07.2020	28.76	28.12	28.59	27.74	0.57K	3.94%
20.07.2020	27.1	27.8	27.96	26.89	0.78K	-5.77%
21.07.2020	27.51	27.85	27.85	26.93	3.99K	1.51%

22.07.2020	27.53	27.15	27.66	26.8	3.85K	0.07%
23.07.2020	28.23	27.65	28.26	27.47	0.12K	2.54%
24.07.2020	27.27	27.78	27.79	27.12	2.49K	-3.40%
27.07.2020	25.91	27	27	25.8	2.01K	-4.99%
28.07.2020	26.67	26.33	26.63	25.95	1.49K	2.93%
29.07.2020	27.13	26.75	27.26	26.7	0.56K	1.72%
30.07.2020	26.48	26.96	26.96	26.09	0.61K	-2.40%
31.07.2020	27.22	26.78	27.69	26.77	3.41K	2.79%
03.08.2020	27.08	27.45	27.45	26.5	0.37K	-0.51%
04.08.2020	27.75	27.27	27.77	27.05	1.90K	2.47%
05.08.2020	27.69	27.64	27.8	27.64	0.67K	-0.22%
06.08.2020	27.3	27.8	28.27	27.34	0.51K	-1.41%
07.08.2020	27.32	27.05	27.58	26.89	0.67K	0.07%
10.08.2020	27.6	27.96	27.96	27.31	3.24K	1.02%
11.08.2020	27.08	27.96	27.96	27.03	0.78K	-1.88%
12.08.2020	26.87	26.65	26.93	26.49	0.22K	-0.78%
13.08.2020	26.3	26.86	27.05	26.22	4.52K	-2.12%
14.08.2020	26.36	26.32	26.37	25.94	0.37K	0.23%
17.08.2020	27.17	26.5	27.23	25.95	1.49K	3.07%
18.08.2020	27.41	27.2	27.66	27.05	1.89K	0.88%
19.08.2020	27.08	27.39	27.6	27.03	1.11K	-1.20%
20.08.2020	26.75	27	27.1	26.52	3.59K	-1.22%
21.08.2020	26.48	26.5	26.51	26.18	1.93K	-1.01%
24.08.2020	28.32	27.5	28.13	27.43	3.71K	6.95%
25.08.2020	29.46	28.7	29.57	28.39	3.27K	4.03%
26.08.2020	29.48	29.38	30.01	29.21	0.75K	0.07%
27.08.2020	29.23	29.45	29.78	29	1.08K	-0.85%
28.08.2020	30.38	29.87	30.69	29.82	0.86K	3.93%
31.08.2020	29.53	30.43	30.43	29.57	0.33K	-2.80%
01.09.2020	28.61	29.43	29.43	28.62	0.75K	-3.12%
02.09.2020	29.06	28.85	29.25	28.55	0.74K	1.57%
03.09.2020	29.53	28.9	29.73	28.9	2.13K	1.62%
04.09.2020	28.13	29.28	29.71	28.06	1.46K	-4.74%
07.09.2020	27.81	28.27	28.27	27.47	0.83K	-1.14%
08.09.2020	27.53	28.49	28.58	27.48	0.36K	-1.01%
09.09.2020	27.94	27.04	27.99	27.04	1.25K	1.49%
10.09.2020	29.15	28.26	28.96	28.12	1.01K	4.33%
11.09.2020	28.99	29.19	29.19	28.27	0.23K	-0.55%
14.09.2020	31.2	29.35	31.23	29.28	0.22K	7.62%
15.09.2020	30.53	31.38	31.4	30.47	1.44K	-2.15%
16.09.2020	30.71	30.6	30.75	29.92	1.22K	0.59%
17.09.2020	29.13	30.15	30.23	29.07	6.15K	-5.14%
18.09.2020	28.68	29.45	29.47	28.71	0.73K	-1.54%
21.09.2020	27.05	28.47	28.47	26.95	5.52K	-5.68%
22.09.2020	28.47	27.32	27.7	26.49	0.66K	5.25%
23.09.2020	27.12	28.42	28.42	27.13	1.29K	-4.74%
24.09.2020	27.4	26.9	27.4	26.73	1.47K	1.03%
25.09.2020	26.75	27.3	27.3	26.63	2.40K	-2.37%
28.09.2020	28.28	27	28.27	26.7	1.72K	5.72%

29.09.2020	27.36	28.01	28.12	27.35	2.38K	-3.25%
30.09.2020	27.5	27.18	27.67	27.12	2.97K	0.51%
01.10.2020	27.07	27.66	27.69	26.83	0.68K	-1.56%
02.10.2020	27.59	26.96	27.95	26.65	1.01K	1.92%
05.10.2020	27.49	27.4	27.74	27.2	0.50K	-0.36%
06.10.2020	27.34	27.48	27.54	27	0.56K	-0.55%
07.10.2020	27.44	27.16	28.17	27.15	1.49K	0.37%
08.10.2020	26.88	27.49	27.5	26.84	1.55K	-2.04%
09.10.2020	26.24	26.91	26.94	26.07	0.75K	-2.38%
12.10.2020	26.4	26.05	26.4	25.8	1.40K	0.61%
13.10.2020	25.74	26.2	26.2	25.7	4.26K	-2.50%
14.10.2020	26.28	25.65	26.38	25.61	1.48K	2.10%
15.10.2020	25.48	25.92	25.93	25.17	3.41K	-3.04%
16.10.2020	25.4	25.68	25.9	25.4	0.84K	-0.31%
19.10.2020	25.49	25.35	25.67	25.17	1.68K	0.35%
20.10.2020	24.92	25.1	25.1	24.75	0.60K	-2.24%
21.10.2020	24.06	24.9	24.9	23.89	3.77K	-3.45%
22.10.2020	24.68	23.8	24.56	23.64	3.02K	2.58%
23.10.2020	25.98	24.98	26.05	24.98	1.10K	5.27%
26.10.2020	24.35	25.37	25.37	24.25	0.41K	-6.27%
27.10.2020	24.55	24.19	24.75	24	1.11K	0.82%
28.10.2020	23.52	24.05	24.05	23.4	1.76K	-4.20%
29.10.2020	24.15	23.4	24.5	23.4	1.66K	2.68%
30.10.2020	24.19	23.77	24.62	23.69	2.46K	0.17%
02.11.2020	24.15	24	24.17	23.3	0.95K	-0.17%
03.11.2020	24.86	24.38	25.09	24.38	1.89K	2.94%
04.11.2020	25.57	24.79	25.64	24.35	1.81K	2.86%
05.11.2020	26.43	25.55	26.59	25.43	0.60K	3.36%
06.11.2020	25.85	26.08	26.45	25.7	1.28K	-2.19%
09.11.2020	26.97	26.47	27.38	25.83	0.60K	4.33%
10.11.2020	26.64	26.74	26.94	26.6	1.24K	-1.22%
11.11.2020	26.52	26.96	27.42	26.65	1.59K	-0.45%
12.11.2020	26.32	26.33	26.48	26.18	1.06K	-0.75%
13.11.2020	26.68	26.37	26.92	26.37	1.94K	1.37%
16.11.2020	27.79	27	27.8	26.99	2.50K	4.16%
17.11.2020	27.04	27.4	27.49	26.98	2.95K	-2.70%
18.11.2020	27.59	28.06	28.2	27.53	0.62K	2.03%
19.11.2020	26.75	27.4	27.47	26.75	0.63K	-3.04%
20.11.2020	27.15	26.7	27.34	26.7	4.53K	1.50%
23.11.2020	27.67	27.66	27.75	27.51	1.62K	1.92%
24.11.2020	28.04	27.49	28.07	27.36	4.07K	1.34%
25.11.2020	28.04	28.05	28.45	27.98	6.91K	0.00%
26.11.2020	28.54	27.9	28.62	27.82	7.64K	1.78%
27.11.2020	28.59	28.78	29.1	28.34	3.84K	0.18%
30.11.2020	29.6	28.58	29.8	28.53	1.42K	3.53%
01.12.2020	29.33	29.69	30.23	29.23	2.82K	-0.91%
02.12.2020	30.01	29.46	30.1	29.17	2.37K	2.32%
03.12.2020	29.46	29.8	30.05	29.37	1.12K	-1.83%
04.12.2020	30.57	29.41	30.75	29.41	2.62K	3.77%

07.12.2020	30.07	30.31	30.31	29.91	2.65K	-1.64%
08.12.2020	30.02	30.04	30.4	30	4.10K	-0.17%
09.12.2020	30.16	30.48	30.6	30.11	7.21K	0.47%
10.12.2020	31.36	30.11	31.45	30.11	7.88K	3.98%
11.12.2020	30.98	31.3	31.77	30.8	4.81K	-1.21%
14.12.2020	31.27	30.83	31.85	30.83	3.82K	0.94%
15.12.2020	32.43	31.57	32.61	31.54	3.10K	3.71%
16.12.2020	32.03	32.54	32.7	31.69	2.30K	-1.23%
17.12.2020	32.21	32.14	32.62	31.8	1.29K	0.56%
18.12.2020	31.36	31.95	31.96	31.06	1.55K	-2.64%
21.12.2020	31.14	30.86	31.18	29.98	0.84K	-0.70%
22.12.2020	31.39	30.93	31.56	30.73	0.69K	0.80%
23.12.2020	32.15	31.72	32.21	31.61	0.43K	2.42%
24.12.2020	32.41	32.31	32.61	32.06	0.42K	0.81%
28.12.2020	33.66	32.7	33.61	32.7	0.13K	3.86%
29.12.2020	33.25	33.41	33.49	32.94	0.36K	-1.22%
30.12.2020	32.42	33.45	33.57	32.33	1.28K	-2.50%
31.12.2020	32.94	32.88	33.21	32.57	0.15K	1.60%
04.01.2021	33.89	33.14	34.45	33.14	1.25K	2.88%
05.01.2021	33.15	33.69	33.83	32.96	1.28K	-2.18%
06.01.2021	33.83	33.71	33.88	33.02	0.43K	2.05%
07.01.2021	34.97	34.05	35	34.05	1.17K	3.37%
08.01.2021	35.14	35.21	35.35	34.55	1.60K	0.49%
11.01.2021	34.76	35.29	35.4	34.46	1.10K	-1.08%
12.01.2021	34.88	34.6	35.59	34.44	1.31K	0.35%
13.01.2021	33.88	34.73	34.85	33.33	1.99K	-2.87%
14.01.2021	33.76	33.77	33.97	32.99	1.62K	-0.35%
15.01.2021	31.96	33.63	33.63	31.89	1.75K	-5.33%
18.01.2021	31.84	31.83	32.51	31.56	1.21K	-0.38%
19.01.2021	33.3	32.11	33.33	32.06	1.14K	4.59%
20.01.2021	33.12	33.49	33.84	33.02	0.70K	-0.54%
21.01.2021	34.32	32.89	34.41	32.83	0.83K	3.62%
22.01.2021	34.45	34.27	34.45	33.77	1.39K	0.38%
25.01.2021	33.39	34.77	34.84	33.35	1.72K	-3.08%
26.01.2021	33.56	33.13	33.74	33.05	1.27K	0.51%
27.01.2021	33.51	33.41	33.67	32.48	0.61K	-0.15%
28.01.2021	34.17	33.81	34.16	33.15	1.06K	1.97%
29.01.2021	33.18	34	34.08	33.16	1.38K	-2.90%
01.02.2021	33.08	33.19	33.58	32.85	0.62K	-0.30%
02.02.2021	35.19	33.29	35.32	33.29	1.04K	6.38%
03.02.2021	37.65	35.15	38.04	35.07	2.59K	6.99%
04.02.2021	37.49	37.76	38.46	36.92	1.38K	-0.42%
05.02.2021	38.43	37.6	38.9	37.43	1.08K	2.51%
08.02.2021	38.84	39.39	39.93	38.7	2.10K	1.07%
09.02.2021	38.49	38.39	38.89	37.8	2.05K	-0.90%
10.02.2021	39.56	38.41	39.94	37.81	3.23K	2.78%
11.02.2021	39	39.5	40.31	38.63	12.72K	-1.42%
12.02.2021	40.28	38.61	40.5	37.4	7.62K	3.28%
15.02.2021	39.81	40.18	40.88	39.73	3.76K	-1.17%

16.02.2021	39.13	39.85	40.79	39.1	5.75K	-1.71%
17.02.2021	38.4	39.25	39.66	38.35	3.99K	-1.87%
18.02.2021	38.61	38.88	38.88	38.18	2.30K	0.55%
19.02.2021	37.7	38.37	38.95	37.68	3.89K	-2.36%
22.02.2021	38.26	37.73	38.41	36.8	1.03K	1.49%
23.02.2021	38.97	38.51	39.04	37.74	2.29K	1.86%
24.02.2021	39.45	38.75	39.64	38.59	0.35K	1.23%
25.02.2021	38.57	39.83	39.83	38.63	1.10K	-2.23%
26.02.2021	37.6	38.03	38.39	37.55	4.43K	-2.51%
01.03.2021	37.45	38.16	38.43	37.43	2.67K	-0.40%
02.03.2021	38.69	37.25	38.73	37.16	3.33K	3.31%
03.03.2021	37.82	38.72	38.75	37.49	2.72K	-2.25%
04.03.2021	38.51	37.95	38.73	37.03	2.10K	1.82%
05.03.2021	39.36	38.6	39.45	38.16	1.70K	2.21%
08.03.2021	39.47	39.76	39.76	38.67	3.13K	0.28%
09.03.2021	40.98	39.57	41.1	39.4	1.61K	3.83%
10.03.2021	41.87	40.96	42.12	40.83	7.58K	2.17%
11.03.2021	42.27	42.01	43.02	41.35	9.37K	0.96%
12.03.2021	43.19	42.16	43.22	41.85	3.02K	2.18%
15.03.2021	42.73	42.44	43.65	42.42	8.30K	-1.07%
16.03.2021	41.96	42.5	42.94	41.92	12.13K	-1.80%
17.03.2021	43.34	42.33	43.4	42.1	5.37K	3.29%
18.03.2021	42.74	43.34	44.07	42.58	8.89K	-1.38%
19.03.2021	42.31	42.4	42.64	41.6	2.72K	-1.01%
22.03.2021	43.18	42.1	43.35	42.09	1.08K	2.06%
23.03.2021	41.78	43.02	43.11	41.67	3.18K	-3.24%
24.03.2021	41.96	41.86	42.03	41.12	3.08K	0.43%
25.03.2021	40.71	41.84	41.95	40	3.48K	-2.98%
26.03.2021	42.09	40.71	42.17	40.64	2.27K	3.39%
29.03.2021	42.2	41.84	42.64	41.19	1.12K	0.26%
30.03.2021	42.4	41.94	42.83	41.83	3.40K	0.47%
31.03.2021	42.89	42.48	43.1	42.37	1.30K	1.16%
01.04.2021	42.81	42.89	43.16	42.53	1.01K	-0.19%
05.04.2021	42.81	42.81	42.81	42.81	-	0.00%
06.04.2021	44.6	43.2	44.65	43.13	2.11K	4.18%
07.04.2021	44.23	44.72	44.72	43.9	1.34K	-0.83%
08.04.2021	43.85	44.15	44.32	43.7	1.67K	-0.86%
09.04.2021	44.03	43.9	44.15	43.54	1.43K	0.41%
12.04.2021	44.86	44.23	44.97	44.07	3.55K	1.89%
13.04.2021	44.24	44.97	45.04	44.15	2.31K	-1.38%
14.04.2021	44.2	44.38	44.56	43.86	2.35K	-0.09%
15.04.2021	44.55	44.32	44.9	44.27	1.50K	0.79%
16.04.2021	44.8	45.15	45.18	44.77	2.36K	0.56%
19.04.2021	44.74	44.9	45.31	44.29	2.55K	-0.13%
20.04.2021	45.29	44.53	45.55	44.42	1.30K	1.23%
21.04.2021	46.32	45.31	46.89	45.3	2.40K	2.27%
22.04.2021	47.51	46.76	47.67	46.66	2.03K	2.57%
23.04.2021	47.38	47.45	47.53	46.53	2.56K	-0.27%
26.04.2021	47.67	47.39	48.13	47.39	1.68K	0.61%

27.04.2021	47.78	47.5	48.28	46.84	1.36K	0.23%
28.04.2021	48.28	48.15	48.85	47.81	7.19K	1.05%
29.04.2021	48.51	48.31	48.65	47.65	2.96K	0.48%
30.04.2021	49.31	48.58	49.83	48.2	7.70K	1.65%
03.05.2021	49.9	49.59	50.34	49.59	0.70K	1.20%
04.05.2021	49.06	50.09	50.33	48.87	3.35K	-1.68%
05.05.2021	49.91	49.32	49.96	49.1	9.53K	1.73%
06.05.2021	50.41	49.96	50.95	49.7	3.74K	1.00%
07.05.2021	50.93	50.58	51.58	49.9	2.97K	1.03%
10.05.2021	52.72	51.5	53.25	51.5	3.14K	3.51%
11.05.2021	53.55	52.38	53.94	51.9	4.22K	1.57%
12.05.2021	55.85	53.86	55.99	53.59	7.59K	4.30%
13.05.2021	55.04	55.36	55.45	53.83	4.29K	-1.45%
14.05.2021	57.23	55.37	57.48	55.24	5.71K	3.98%
17.05.2021	56.97	57.02	57.37	56	6.41K	-0.45%
18.05.2021	53.74	56.45	57.14	53.08	5.36K	-5.67%
19.05.2021	50.35	52.92	53.6	49.3	13.60K	-6.31%
20.05.2021	53.41	50.65	53.47	50.59	8.41K	6.08%
21.05.2021	52.43	52.75	54.34	51.74	5.66K	-1.83%
24.05.2021	53.41	52.2	53.51	51.4	2.56K	1.87%
25.05.2021	53.83	53.81	54.27	52.83	4.14K	0.79%
26.05.2021	54.22	54.13	55.23	53.2	4.37K	0.72%
27.05.2021	52.39	53.59	54.14	51.58	2.11K	-3.38%
28.05.2021	51.58	52.23	52.9	50.78	3.11K	-1.55%
31.05.2021	52.24	52.38	52.42	51.88	5.89K	1.28%
01.06.2021	52.97	52.77	53.7	52.32	1.19K	1.40%
02.06.2021	51.94	52.52	52.55	51.44	3.93K	-1.94%
03.06.2021	50.73	52.85	53.15	50.66	4.66K	-2.33%
04.06.2021	50.47	50.61	51.95	49.8	2.28K	-0.51%
07.06.2021	51.97	49.83	52.5	49.83	0.24K	2.97%
08.06.2021	52.58	52.33	53.1	52.07	4.05K	1.17%
09.06.2021	53.9	53	54.6	52.81	2.84K	2.51%
10.06.2021	54.15	53.62	54.33	53.05	1.67K	0.46%
11.06.2021	53.07	53.95	54.2	52.8	2.34K	-1.99%
14.06.2021	53.29	53.43	54.36	52.94	1.42K	0.41%
15.06.2021	51.76	53.01	53.01	51.43	5.30K	-2.87%
16.06.2021	51.72	51.9	52.7	51.15	3.02K	-0.08%
17.06.2021	51.28	51.33	51.75	50.76	1.93K	-0.85%
18.06.2021	52.26	51.7	52.41	51.61	1.58K	1.91%
21.06.2021	52.78	52.16	53.31	51.99	3.48K	1.00%
22.06.2021	53.76	53.23	53.81	53.16	4.31K	1.86%
23.06.2021	55.03	53.99	55.2	53.88	6.79K	2.36%
24.06.2021	55.49	54.85	55.73	54.66	5.72K	0.84%
25.06.2021	55.48	55.67	56.16	55.3	8.06K	-0.02%
28.06.2021	55.9	55.89	56.31	55.05	6.24K	0.76%
29.06.2021	56.04	55.75	56.57	55.61	2.37K	0.25%
30.06.2021	56.78	55.8	57.03	55.62	5.06K	1.32%
01.07.2021	58.06	57.09	59	57.02	3.68K	2.25%
02.07.2021	57.76	58.41	58.77	57.56	1.40K	-0.52%

05.07.2021	58.28	58.02	58.69	57.97	0.75K	0.90%
06.07.2021	54.44	58.56	58.58	52.68	3.61K	-6.59%
07.07.2021	53.03	53.93	55.37	52.9	2.74K	-2.59%
08.07.2021	52.77	53.11	53.6	51.32	3.48K	-0.49%
09.07.2021	54.67	53.55	54.86	53.3	3.59K	3.60%
12.07.2021	52.12	54.22	54.22	51.95	2.07K	-4.66%
13.07.2021	53.26	52.15	53.7	51.7	2.09K	2.19%
14.07.2021	53.78	52.81	55.88	52.05	2.44K	0.98%
15.07.2021	53.37	52.8	53.9	52.3	2.60K	-0.76%
16.07.2021	53.28	53.59	53.98	52.74	3.01K	-0.17%
19.07.2021	52.81	53	54.35	52.4	3.87K	-0.88%
20.07.2021	51.59	52.72	52.81	50.87	2.65K	-2.31%
21.07.2021	52.51	51.82	52.65	51.3	5.73K	1.78%
22.07.2021	51.16	52.04	52.58	50.46	4.19K	-2.57%
23.07.2021	51.26	50.4	51.31	50.37	5.45K	0.20%
26.07.2021	53.57	51.1	53.71	50.96	1.44K	4.51%
27.07.2021	53.28	54	54.06	53.2	2.39K	-0.54%
28.07.2021	54.2	53.54	54.53	53.54	1.21K	1.73%
29.07.2021	54.41	54.42	54.69	53.51	1.89K	0.39%
30.07.2021	53.69	54.15	54.24	53.2	1.35K	-1.32%
02.08.2021	54.79	53.47	55.56	53.46	2.01K	2.05%
03.08.2021	54.55	54.75	55.48	54.42	1.20K	-0.44%
04.08.2021	55.82	54.88	55.93	54.55	1.19K	2.33%
05.08.2021	56.34	55.95	56.48	55.05	1.86K	0.93%
06.08.2021	57.02	56.63	57.3	56.54	1.83K	1.21%
09.08.2021	56.98	56.9	57.7	56.25	2.14K	-0.07%
10.08.2021	57.77	57.45	57.92	56.96	1.75K	1.39%
11.08.2021	58.14	57.37	58.53	56.34	2.38K	0.64%
12.08.2021	56.63	57.99	58.4	56.3	1.92K	-2.60%
13.08.2021	55.74	56.73	56.73	55.58	1.51K	-1.57%
16.08.2021	58.52	55.5	58.6	55.46	0.92K	4.99%
17.08.2021	57.56	58.28	58.58	57.37	3.41K	-1.64%
18.08.2021	57.45	57.42	58.37	55.73	3.12K	-0.19%
19.08.2021	53.84	57.3	57.3	52.86	10.11K	-6.28%
20.08.2021	54.72	54.03	55.2	53.82	4.13K	1.63%
23.08.2021	55.67	55.53	56.55	55.26	5.65K	1.74%
24.08.2021	56.97	56.08	57.18	55.79	2.99K	2.34%
25.08.2021	56.87	56.98	57.42	56.19	2.41K	-0.18%
26.08.2021	57.19	56.65	57.86	55.97	1.32K	0.56%
27.08.2021	59.32	57.84	60.25	57.84	7.80K	3.72%
30.08.2021	61.08	60.31	61.29	60.15	4.29K	2.97%
31.08.2021	61.07	60.56	61.25	60.26	3.09K	-0.02%
01.09.2021	60.42	61.14	62.18	60	7.52K	-1.06%
02.09.2021	61.83	60.62	62.03	59.89	1.92K	2.33%
03.09.2021	61.63	61.69	62.75	61.44	3.37K	-0.32%
06.09.2021	62.61	62.48	63.47	62.17	2.32K	1.59%
07.09.2021	62.28	63.03	63.16	61.96	4.40K	-0.53%
08.09.2021	62.74	62.71	63.61	62.27	4.77K	0.74%
09.09.2021	63.04	62.55	63.36	62.17	3.45K	0.48%

10.09.2021	61.22	63.13	63.17	60.95	2.94K	-2.89%
13.09.2021	61.37	61.23	62.99	61.2	5.21K	0.25%
14.09.2021	60.16	61.8	62.25	59.6	7.05K	-1.97%
15.09.2021	60.18	60.51	61.71	59.1	5.10K	0.03%
16.09.2021	59.63	59.61	60.98	58.64	5.51K	-0.91%
17.09.2021	59.82	59.93	60.48	59.44	6.71K	0.32%
20.09.2021	61.02	59.59	61.36	58.88	8.92K	2.01%
21.09.2021	60.5	60.95	61.5	60.21	2.43K	-0.85%
22.09.2021	60.94	60.64	61.05	60.2	5.54K	0.73%
23.09.2021	60.89	60.96	61.47	59.5	6.07K	-0.08%
24.09.2021	63.29	60.85	64.5	60.29	4.84K	3.94%
27.09.2021	64.72	64.25	65.33	64	6.05K	2.26%
28.09.2021	62.29	65.75	66	62.07	8.30K	-3.75%
29.09.2021	63.28	63.46	63.5	61.74	7.27K	1.59%
30.09.2021	62.16	63.27	63.27	60.73	5.41K	-1.77%
01.10.2021	62.45	62.25	64.15	61.53	2.89K	0.47%
04.10.2021	63.82	63.27	64.9	62.71	3.33K	2.19%
05.10.2021	65.16	64.25	65.8	64.2	9.91K	2.10%
06.10.2021	59.58	65.16	65.16	59.35	12.72K	-8.56%
07.10.2021	60.81	60.18	61.11	58.2	9.85K	2.06%
08.10.2021	58.76	60.49	61.15	58.3	6.56K	-3.37%
11.10.2021	59.58	58.67	60.66	58.49	2.33K	1.40%
12.10.2021	59.34	59.52	59.91	58.91	3.00K	-0.40%
13.10.2021	59.45	59.42	60.54	58.65	5.22K	0.19%
14.10.2021	61.79	59.79	62.08	59.79	10.06K	3.94%
15.10.2021	59.79	62.16	62.19	58.62	4.22K	-3.24%
18.10.2021	58.92	58.93	60	57.64	4.49K	-1.46%
19.10.2021	54.92	58.26	58.69	54.45	7.93K	-6.79%
20.10.2021	58.14	55.48	58.48	55.48	6.45K	5.86%
21.10.2021	58.37	57.8	58.99	56.9	12.64K	0.40%
22.10.2021	58.64	58.51	60.53	58.44	4.74K	0.46%
25.10.2021	59.35	59.51	60.11	58.92	4.84K	1.21%
26.10.2021	60.16	59.68	60.54	59.14	5.47K	1.36%
27.10.2021	60.27	60	60.45	59.2	4.64K	0.18%
28.10.2021	58.94	59.73	59.84	58.32	3.46K	-2.21%
29.10.2021	59.08	59.3	59.87	58.5	6.87K	0.24%
01.11.2021	57.29	59.41	60.78	57	4.70K	-3.03%
02.11.2021	59.79	57.7	60	57.5	15.25K	4.36%
03.11.2021	60.15	59.86	60.67	59.42	6.88K	0.60%
04.11.2021	60.18	59.76	61.76	59.25	5.61K	0.05%
05.11.2021	59.73	60.23	61.53	59.63	8.23K	-0.75%
08.11.2021	60.96	60.27	61.43	60.16	10.61K	2.06%
09.11.2021	60.75	60.35	61.7	60.23	6.80K	-0.34%
10.11.2021	63.48	60.45	63.58	60.31	8.93K	4.49%
11.11.2021	64.02	63.12	64.22	62.4	4.90K	0.85%
12.11.2021	63.58	63.98	64.81	63.43	4.86K	-0.69%
15.11.2021	66.22	63.94	67.27	63.94	9.55K	4.15%
16.11.2021	67.83	66.8	68.1	66.57	8.17K	2.43%
17.11.2021	67.45	68.15	68.73	67.1	10.94K	-0.56%

18.11.2021	69.38	67.57	69.49	66.62	9.09K	2.86%
19.11.2021	69.65	69.47	70.1	68.9	6.42K	0.39%
22.11.2021	70.22	70.09	71.48	69.59	7.51K	0.82%
23.11.2021	69.49	70.3	70.93	69.1	12.72K	-1.04%
24.11.2021	73.23	69.93	73.48	69.25	13.30K	5.38%
25.11.2021	74.79	73.58	75.37	72.5	13.11K	2.13%
26.11.2021	73.12	74.38	74.51	70.7	7.14K	-2.23%
29.11.2021	74.54	74.2	76.06	74.2	13.08K	1.94%
30.11.2021	75.73	74.12	75.81	73.54	14.83K	1.60%
01.12.2021	77.2	75.95	78.76	75.6	10.85K	1.94%
02.12.2021	80.25	76.51	80.35	76.5	15.68K	3.95%
03.12.2021	78.64	80.41	80.8	78.38	12.64K	-2.01%
06.12.2021	81.65	79.14	82.17	78.74	15.71K	3.83%
07.12.2021	85.34	82.3	85.94	82.3	19.74K	4.52%
08.12.2021	89.41	85.64	91.19	85.51	27.84K	4.77%
09.12.2021	80.88	90.25	90.75	80.4	29.01K	-9.54%
10.12.2021	84.37	81.08	84.5	80.48	29.31K	4.32%
13.12.2021	82.72	84.8	87.4	82.2	18.39K	-1.96%
14.12.2021	80.12	82.32	83.88	78.9	21.06K	-3.14%
15.12.2021	81.19	80.35	82.24	80.1	28.37K	1.34%
16.12.2021	85.71	82.18	86.05	81.12	34.66K	5.57%
17.12.2021	74.02	85.25	85.25	73.25	42.72K	-13.64%
20.12.2021	80.09	74	81.75	73.42	28.04K	8.20%
21.12.2021	80.94	80.52	82.85	78.09	18.01K	1.06%
22.12.2021	76.83	80.07	80.17	75.45	31.50K	-5.08%
23.12.2021	74.46	77.5	77.75	74.25	19.47K	-3.08%
24.12.2021	76.31	74.7	76.87	74.51	2.38K	2.48%
27.12.2021	76.92	75.87	77.13	75.04	3.63K	0.80%
28.12.2021	79.29	76.8	79.69	76.21	4.61K	3.08%
29.12.2021	80.36	79.13	80.87	78.11	13.84K	1.35%
30.12.2021	80.16	80.5	80.65	79.25	8.54K	-0.25%
31.12.2021	80.65	79.98	81.25	79.55	3.69K	0.61%
03.01.2022	84.01	79.8	84.4	79.8	9.98K	4.17%
04.01.2022	84.91	83.95	86.8	83.81	17.53K	1.07%
05.01.2022	87.58	85.9	88.55	85.27	20.64K	3.14%
06.01.2022	86.74	87.47	87.8	85.33	13.39K	-0.96%
07.01.2022	85.42	86.8	87.61	85.21	15.83K	-1.52%
10.01.2022	80.09	86.12	87	79.8	30.95K	-6.24%
11.01.2022	81.3	81.4	84.45	80.12	23.49K	1.51%
12.01.2022	80.01	82.7	83.24	79.15	20.17K	-1.59%
13.01.2022	80.56	80.2	81.43	77.55	25.06K	0.69%
14.01.2022	82.08	82.05	83.75	81.5	24.95K	1.89%
17.01.2022	80.58	82.7	82.75	79.88	15.80K	-1.83%
18.01.2022	82.67	80.4	82.97	79	46.23K	2.59%
19.01.2022	82.09	82.8	82.8	80.8	31.78K	-0.70%
20.01.2022	85.59	81.34	85.97	80.53	31.23K	4.26%
21.01.2022	84.47	85.21	85.65	83.28	20.16K	-1.31%
24.01.2022	84.02	84.4	86.45	83.02	26.65K	-0.53%
25.01.2022	87.45	84.3	88.1	83.61	28.18K	4.08%

26.01.2022	88.66	87.37	90	86.63	28.00K	1.38%
27.01.2022	89.76	87.9	89.95	87.9	21.72K	1.24%
28.01.2022	89.22	89.4	90.63	88.88	19.66K	-0.60%
31.01.2022	89.24	89.37	89.95	88.1	17.72K	0.02%
01.02.2022	89.52	89.74	89.94	87.16	22.35K	0.31%
02.02.2022	94.21	90	94.62	89.6	40.36K	5.24%
03.02.2022	94.81	94.25	94.94	93.1	22.09K	0.64%
04.02.2022	96.45	94.89	97.5	94.44	27.89K	1.73%
07.02.2022	96.7	96.62	96.8	93.7	24.30K	0.26%
08.02.2022	96.93	97	98.49	95.25	30.32K	0.24%
09.02.2022	90.79	96.29	97.6	90.26	35.63K	-6.33%
10.02.2022	90.78	91.45	93.42	89.25	28.87K	-0.01%
11.02.2022	92.87	90.5	93.38	88.5	24.98K	2.30%
14.02.2022	91.76	93.7	94	89.9	23.37K	-1.20%
15.02.2022	91.14	91.48	92.75	90.31	26.15K	-0.68%
16.02.2022	89.86	90.29	91.21	87.77	31.05K	-1.40%
17.02.2022	86.44	89.84	90.45	85.8	31.59K	-3.81%
18.02.2022	89.47	86.16	89.66	86.16	21.37K	3.51%
21.02.2022	89.68	89.07	90.95	88.02	19.95K	0.23%
22.02.2022	89.77	89.9	90.28	88.1	22.31K	0.10%
23.02.2022	95.07	89.79	95.56	89.54	30.15K	5.90%
24.02.2022	87.03	95	95	86.15	49.74K	-8.46%
25.02.2022	88.14	88.24	89.7	87.06	20.87K	1.28%
28.02.2022	82.21	85.94	86	80.12	36.02K	-6.73%
01.03.2022	68.85	82.6	84.43	66	78.66K	-16.25%
02.03.2022	68.49	70.55	70.96	55	78.46K	-0.52%
03.03.2022	67.35	68.7	69.49	63.49	40.64K	-1.66%
04.03.2022	65.1	66	68.74	64.3	35.93K	-3.34%
07.03.2022	58.3	64.29	64.29	56.82	47.75K	-10.45%
08.03.2022	68.51	57.4	69.29	56.5	38.50K	17.51%
09.03.2022	73.18	68.02	74.67	67.22	36.12K	6.82%
10.03.2022	76.41	72.53	76.68	69.52	32.70K	4.41%
11.03.2022	76.76	75.93	78	73.71	22.27K	0.46%
14.03.2022	78.28	76	81.5	75.81	19.37K	1.98%
15.03.2022	77.43	77	79.15	75.01	24.73K	-1.09%
16.03.2022	78.16	77.51	79.11	75.25	22.57K	0.94%
17.03.2022	79.89	79.18	80.19	76.32	23.82K	2.21%
18.03.2022	78.89	80	80	78.32	19.04K	-1.25%
21.03.2022	78.39	78.72	79.74	77.52	13.94K	-0.63%
22.03.2022	80.67	79.05	81.4	78.61	18.47K	2.91%
23.03.2022	76.6	80.9	81.3	75.85	30.57K	-5.05%
24.03.2022	78.24	76.62	79.24	75.9	16.43K	2.14%
25.03.2022	78.6	78.26	79.06	77.23	18.50K	0.46%
28.03.2022	80.81	78.7	81.99	77.87	22.02K	2.81%
29.03.2022	81.7	80.9	81.99	80.17	25.58K	1.10%
30.03.2022	78.31	81.05	81.62	76.8	37.77K	-4.15%
31.03.2022	76.48	78.51	80.5	75.35	35.66K	-2.34%
01.04.2022	78.49	77	79.88	76.34	16.91K	2.63%
04.04.2022	78.5	78.22	79.4	77.14	15.61K	0.01%

05.04.2022	78.05	78.76	78.94	77.44	17.90K	-0.57%
06.04.2022	77.18	78.01	79.56	76.71	19.74K	-1.11%
07.04.2022	79.94	77.17	80.4	76.34	19.50K	3.58%
08.04.2022	80.09	79.63	80.98	79.51	13.93K	0.19%
11.04.2022	77.95	79.75	80.16	77.55	16.22K	-2.67%
12.04.2022	79.01	77.65	79.29	76.85	16.03K	1.36%
13.04.2022	77.44	79.17	79.17	77.23	15.19K	-1.99%
14.04.2022	79.97	77.38	80.25	77.38	15.28K	3.27%
19.04.2022	80.2	80.14	80.95	79.52	18.38K	0.29%
20.04.2022	87.82	80.44	88.5	79.79	30.56K	9.50%
21.04.2022	86.44	86.5	87.69	85.58	14.75K	-1.57%
22.04.2022	88.99	85.99	89.89	85.75	22.33K	2.95%
25.04.2022	83.46	88.09	88.32	82.3	24.04K	-6.21%
26.04.2022	82.71	84.58	85.25	81.95	22.85K	-0.90%
27.04.2022	81.01	81.25	81.94	78.8	22.30K	-2.06%
28.04.2022	82.68	81.48	83.67	79.9	20.23K	2.06%
29.04.2022	84.45	82.97	85.84	82.29	16.07K	2.14%
02.05.2022	83.08	83.59	84.89	82.44	9.74K	-1.62%
03.05.2022	88.45	83.3	89.06	82.72	17.67K	6.46%
04.05.2022	87.94	88.21	89.32	85.98	16.57K	-0.58%
05.05.2022	88.99	88.7	91.99	86.82	22.11K	1.19%
06.05.2022	91.78	89.63	92.36	88.4	16.29K	3.14%
09.05.2022	86.88	92	92.22	86.52	22.32K	-5.34%
10.05.2022	87.52	86.72	88.69	85.75	14.95K	0.74%
11.05.2022	89.2	87.52	90	82.1	25.57K	1.92%
12.05.2022	88.16	88.83	89.05	86.75	15.03K	-1.17%
13.05.2022	88.48	88.07	90.5	87.6	11.94K	0.36%
16.05.2022	90.24	87.63	90.35	87.63	12.02K	1.99%
17.05.2022	92.24	90.37	92.75	89.62	15.30K	2.22%
18.05.2022	84.65	88.75	90	82.78	29.69K	-8.23%
19.05.2022	82.97	84.38	85.55	80.16	20.65K	-1.98%
20.05.2022	80.37	83.5	84.2	80.16	15.78K	-3.13%
23.05.2022	77.82	80.16	82.67	77.8	17.17K	-3.17%
24.05.2022	80.84	77.9	82.66	77.4	17.02K	3.88%
25.05.2022	81.5	80.93	82.63	80.29	10.40K	0.82%
26.05.2022	85.12	81.11	85.18	81.11	7.76K	4.44%
27.05.2022	83.98	84.9	85.33	83.45	7.78K	-1.34%
30.05.2022	83.2	84.36	85.05	83.09	8.65K	-0.93%
31.05.2022	84.01	84	84.96	83.5	9.98K	0.97%
01.06.2022	86.42	84.22	87.58	83.81	13.23K	2.87%
02.06.2022	86.21	86.15	88.64	85.62	8.33K	-0.24%
03.06.2022	87.09	86.34	87.33	85.99	4.57K	1.02%
06.06.2022	82.11	87.21	87.21	81.24	14.18K	-5.72%
07.06.2022	80.9	82.07	82.79	80.65	11.97K	-1.47%