*Report*
DYNAMO 102
2/4 2019

# *Concave...*

Throughout last year, we dedicated time to carefully studying business growth. Microeconomic Theory regularly revisits this topic. From the formal mathematical models of the neoclassical forebearers to the more recent Industrial Organization research, economists have sought to understand the mechanisms that drive business growth. What is the best decision in each case? Diversification, organic development, acquisition? What is the most appropriate capital structure? What happens to the norms of competition and comparative advantage in a new business configuration? And what about the problems of people management and establishing corporate culture? Is the Marshallian cycle, where companies grow rapidly in the first years and then "tire out" and die, inevitable? Are startups, the contemporary "invaders" that threaten established empires and are now emboldened by rapid technological transformations, an inevitable fate? We combed the theoretical literature and empirical studies, searching for intelligent insights about this topic to incorporate into our analytic toolbox. We had our reference materials almost ready for publication. We were on track to keep our commitment to the established rhythm of producing nearly four Letters per year.

Naturally, our priorities changed with the onset of the virus. Everything changed. We decided to interrupt our previous work and dedicate ourselves to understanding the pandemic and its impacts on life in general, and on our activities at Dynamo in particular. This Report and the next are "special editions" of sorts. They synthesize our efforts to absorb an enigmatic and multidimensional reality. This first text contains information and reflections on the virus, the disease and its spread. We made observation our trade as we navigated this unknown territory, seeking to bring together elements that allow our readers see how we are following the more technical side of the coronavirus. We suggest that readers who are already familiar with the inexhaustible resources available on this topic go directly to the next Report. There, we will be in more familiar territory, analyzing the repercussions of the pandemic on economic activity, its consequences for capital markets, and its implications for managing the Fund's portfolio.

We have been working from home to adapt our portfolio to these strange times of brutal volatility, both real and metaphorical, and to prepare it for what is to come post-coronavirus. The next Report tries to chronicle these ongoing reformulations.

Later on down the year, when we may start seeing a lull on the horizon, we intend to return to the project of editing our reflections on the topic of business growth.

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They say that a great artist transcends his time, evidenced when people seek an explanation for their present circumstances in artworks from the past. Many recognize Maurits Cornelis Escher (1898-1972) as the greatest creator of woodcuttings and lithographs of all time. If Euclides created geometry, Escher set it in motion. In his skilled hands, a portfolio of isometric techniques - translations, reflections, and rotations - projected the flat plane into space as countless optical illusions and impossible situations.

His work seems particularly appropriate to describe our current situation. We identify three parallels: (i) Through the recurring theme of stairs, Escher's prints imply mobility. However, the displacement that promises to lead to progress quickly disappoints when we notice that we have returned to where we started. The pandemic brought on the feeling civilization has reached a "recalcitrant plane." We advance in some ways and, at the same time, seemingly return a hundred years with *deja vu* of the Spanish Flu; (ii) Another common theme is the representation of reptiles, fishes, birds, and men densely packed that carefully disperse in coordinated metamorphoses. Here we remember our state of social confinement and the need to work together to find a path to gradual exit; (iii) In the work *Concave and Convex* (1955), Escher reveals the same landscape from two different perspectives. It seems as if we are viewing the concave part from below and the convex part from above. As you will read on the following pages, the graph that we think best summarizes the moment we are experiencing contains two curves, one concave another convex. As in Escher's work, this apparent duality refers to the same reality. Instead of dwelling in ambiguity, we have to find the balance in a asynchronization of the two dimensions.

The virus has transformed the planet, profoundly changing our daily lives in a very short time. It promises to leave lasting repercussions on multiple dimensions of our lives. It is the most studied and most commented topic of the moment. Fortunately, many quality analyses circulate on the internet. We are aware that we have little to add to a topic with which we have no prior experience. Still, we have decided to share some reflections in this moment of collective introspection.[1]

We divided the task into two Reports organized as follows: in this first one, we deal exclusively with the virus in three dimensions and two sections. The first includes our understanding of the nature of the pathogen, the disease etiology, and available therapeutic options. The second considers epidemiological factors and the mechanisms of virus transmission in society. In the next Report, we weave together some considerations about the nature of the economy and how the restrictions of social distancing affect it. Then, we record the effects of the crisis on capital markets and describe how Dynamo has organized its analysis and Fund management at these particularly challenging times. Finally, we conclude with a handful of reflections, taking philosophical liberty during this unusual moment.

## Morphology and Pathogenesis

Viruses are unique structures. In their most basic form, they consist of a small segment of nucleic acid encapsulated in proteins. They have no metabolism of their own. Opportunists, they invade other organisms and take ownership of their cellular machinery for replication. Most experts do not consider them to be living, although some identify life-like qualities in their interactions with other organisms. Apparently simple, they have enormously diverse structures and complex functions. Viruses are classified into 6,590 different species. They are said to be present in virtually all organisms in nature.

The Sars-Cov-2 virus that causes Covid-19 is in the coronavirus family, hence the name new coronavirus (nC). Coronaviruses are RNA viruses that are widely distributed among humans and various animals, including mammals and birds. They cause acute and persistent infections. Scientists isolated the first viruses of this family in the 1930s, identifying them as disease-causing agents in birds, pigs, and rats. It wasn't until the 1960s that they identified the characteristics that group coronaviruses with others causing respiratory diseases in humans. The origin of the name coronavirus did not come from "its rounded form," as the media initially reported. There are several other virus families with the same spherical morphology. Instead, the name refers to the radiant protrusions on the virus' surface that resemble the sun's corona.

SARS-CoV-2 is the seventh known coronavirus infecting humans. SARS-CoV, MERS-CoV, and SARS-CoV-2 can cause severe illness, while HKU1, NL63, OC43, and 229E are associated with mild symptoms. As for the most likely origin of SARS-CoV-2, it is known to share 96.2% of its genome with a specific line of coronavirus present in bats found in Yunnan province in China. The biochemical process through which the virus infects men is now better understood. Spike proteins on the surface of the SARS-CoV-2 virus bind to receptors on human cells, most often through ECA2, an enzyme component of the system responsible for regulating blood pressure. The virus also attacks the T-cells of the immune system, causing cellular apoptosis or programmed self-destruction.

1 *As usual, we have made a complete list of the references used to craft these texts available in the library on our site (https://www.dynamo.com.br/pt/biblioteca).*

A perverse element of this cellular hijacking strategy is that some of the virus' receptors are particularly abundant in individuals with heart problems and diabetes. Hence the higher levels of fatalities occurring in cases with comorbidities and in the elderly. The nC itself is not considered a highly aggressive pathogen. Clinical complications arise as a consequence of our inadequate immune response. In cases that are caught early, however, immunosuppressants can be part of the therapeutic package.

In the five months since the first case, progress in understanding the virus's molecular structure and its replication process has been extraordinary, thanks to a global effort and unprecedented collaboration. The virus has brought the scientific community together. More than three thousand fragments of RNA extracted from nC are being made available in a unified database, for example. Journals are working on a fast track basis and publishing thousands of specialized articles with unprecedented speed. Researchers from different disciplines and laboratories around the world are sharing results. The response to this pandemic has been pansophy, different from what happened during the Spanish Flu last century. Whereas then, the world was still divided by WWI, now, technology supports the cooperation effort. Modern digital equipment such as high-resolution electron microscopes, genetic sequencing, and applied artificial intelligence are essential allies in the clinical trenches. Computers are designing proteins that connect to SARS-CoV-2 spike proteins to neutralize its action. Robots are reading CT scans and X-ray images to help doctors detect the disease.

The WHO reports that there are currently eight vaccine candidates undergoing clinical trials and another hundred and two vaccine candidates in pre-clinical trials. The WHO also identifies 213 different experimental treatments being analyzed as therapeutic alternatives for Covid-19. These experimental treatments are wide ranging and include drugs in the antiviral, antibiotic, antimalarial, antiparasitic, antifungal, anti-inflammatory, immunosuppressive, kinase inhibiting, mucolytic, anticoagulant, and antidepressant groups, as well as countless other non-drug treatments using plasma, umbilical cord stem cells, probiotics, or inhalers (WHO, 2020a).

Researchers are trying to build on the clinical experiences of the most recent respiratory epidemics (SARS and MERS). Experimental options need to pass through an extensive and rigorous filter before they become accepted therapies. Experts estimate that a vaccine will be approved for commercial-scale production in 12 to 18 months. The exchange of therapeutic experiences around the world and the possibility of testing large-scale clinical procedures with control groups have contributed to the rapidly advancing understanding of the disease. Currently, doctors on the front lines of care in the ICUs report that promising therapies involve a combination of antibiotics, anti-inflammatory drugs, anticoagulants, and immunosuppressants.

Another critical factor is the virus' mutation rate. As a virus reproduces by making copies of itself, it generates "errors" in its genome and transfers them to future generations. The replication of the RNA viruses that cause many respiratory illnesses is more prone to errors, accumulating mutations in each reproductive cycle. Unlike DNA viruses, RNA viruses do not have the same ability to fix errors during the process of transcribing the genetic code. Their "quality control" is deficient, making them more susceptible to mutation.

According recent research, the good news is that the SARS-CoV-2 virus that causes Covid-19 has a reduced "error rate," meaning that the rate of mutations remains slow, despite the high rate of transmission. The fact that the virus remains reasonably stable as it transits between hundreds of thousands of patients leads researchers to believe it is less likely to become more (or less) pathogenic as it spreads. Besides, multiple genes control the contagion capacity of the virus and how harmful it is to its host, two of its fundamental characteristics. Changes in these properties involve more complicated processes than can be achieved in a single mutation. Thus, according to experts, the chances of the virus changing and becoming more lethal or contagious on a time scale of weeks, months, or even a couple of years are remote.

On the other hand, mutations can occur that: i) confuse the results of diagnostic tests by causing minor changes in the region of the virus they detect; ii) make the virus resistant to antivirals, in a similar way that bacteria become resistant to antibiotics. Hence, screening for mutations to SARS-CoV-2 is key to updating diagnostic kits and therapies.

The reasonable stability of nC helps scientists better understand what they are facing and consequently facilitates their proposing viable solutions. This is an advantage for vaccine development. Recent studies find that SARS-CoV-2 accumulates mutations at a rate two to four times lower than that of the flu. The high mutation rate of the influenza virus has an impact on our immune response and requires a new vaccine every year. In the case of nC, everything indicates that once developed, the vaccine would have a life span of a few years rather than a few months. Perhaps it is more similar to the measles, smallpox, and yellow fever than to influenza.

Though science and technology have shown consistent progress in understanding the virus's etiology, many doubts remain about the pathophysiology of SARS-CoV-2. As the infection spreads across the planet, new symptoms appear that expand the diagnostic spectrum. While the virus at first seemed to cause severe respiratory problems, it is now associated with other complications such as microbe formation through the body and vascular impairment.

And significant questions remain unanswered regarding the immune response. For example, why do some infected individuals have mild symptoms or no symptoms at all? Why are late and weak immune responses associated with more severe cases? (Melgaço et al., 2020) And more importantly, how long is the "lasting" immune response preserved? A longitudinal clinical study after the 2003 SARS epidemic showed that most individuals retained immune memory for 35 to 60 months after infection (Tang et al. 2011). We don't yet know whether we expect the same results for nC.

## Epidemiology

To understand our second topic of interest, epidemiology, we need to understand some variables. The first is the reproduction rate (R), defined as the average number of new infections initiated by an infected individual in a susceptible population within the incubation period. R is commonly expressed in two ways: $R_0$ describes the level of potential transmissibility of the virus by a single infected person. As the disease progresses over time, $R_t$ becomes more relevant. The concept is the same: a simple product of the number of daily contacts, the risk of infection by contact, and the incubation period. The Ministry of Health estimates an $R_0$ of 2.74 in Brazil. For comparison, the $R_0$ of measles is between 12 and 18. Influenza's $R_0$ is between 1.5 and 2.

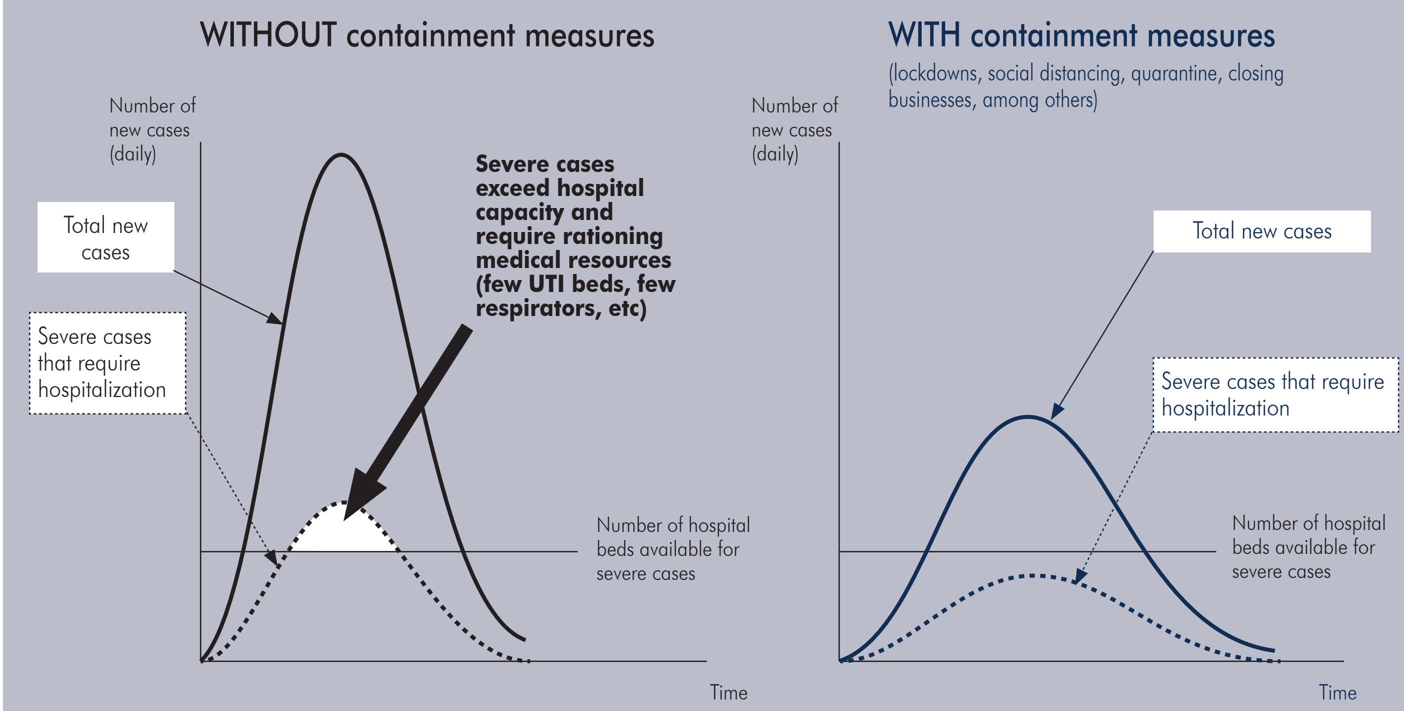
Respiratory viruses spread easily because they are transmitted by free particles that are expelled by infected hosts and can simultaneously infect a significant number of susceptible individuals. Their transmission is density-dependent, differing from infections spread by zoonotic vectors, such as malaria, dengue, and Zika, where mosquitoes need time to digest between bites, imposing a natural limitation on the speed of infection. In this case, transmission is frequency-dependent.

Another relevant measure is the doubling time of the epidemic, which is currently between 1.7 to 2.9 days in Brazil. The combination of a high $R_0$ and a high doubling time determines the pace of the outbreak and the need for rapid intervention. If China had implemented drastic containment measures a week earlier, experts estimate that it would have avoided about two-thirds of infections.

The control of infectious diseases only occurs when the recovery speed is faster than the speed of contagion, or when $R_0$ becomes less than one. Complete horizontal isolation aims to reduce transmissibility by compressing $R_t$, while gaining the health system precious time to equip itself for the pandemic. This is "flattening the curve." According to the Ministry of Health, mathematical models estimate that around a 50% reduction in contacts between people would have a significant impact on the total number of cases, reducing Covid-19's Rt to close to one. Also, non-pharmacological measures delay and reduce the peak of the epidemic curve, allowing for better distribution of cases over time and avoiding the collapse of health services. In Figure 1, we present the graphs that illustrate this point.

Here, we must remember that $R_0$ is an average, and that looking at this statistic in the aggregate is dangerous simplification that hides disparate realities. $R_0$ depends on demographic concentration, the possibility of effectively practicing social distancing, the degree of dependence on public transportation, the relative density of essential activities in the region, the level of comfort and densification of residences, and the standard of civil obedience and responsibility, among other aspects. Each micro-region may present an $R_0$ quite different from its

## Figure 1 – *Containment measures & social distancing save lives by avoiding draining medical resources*




*Source: Baldwin, R. e di Mauro, B., 2020.*

neighbor, as we are witnessing in several locations in Brazil. This unfortunately reflects yet another facet of our social inequality. Thus, even if $R_0$ falls below one, we may still have significant outbreaks. Like earthquakes and forest fires, epidemiological processes also present characteristics of long-tail events. Even when the national average seems under control, we will probably still face significant localized outbreaks. Similarly, underreporting has meant that the doubling time of the disease is inaccurate.

Another relevant variable is the incubation period, defined as the time that elapses between the moment of infection and when symptoms appear. In the case of nC, it is between 2 and 14 days, with an estimated average of 5.2 days. Occurrence has been documented after as long as 24 days. The seasonal flu, in contrast, has an interval of up to only two days. While in most infections viral transmission occurs during within a day or two of the onset of symptoms, in the case of nC, transmission can occur without the manifestation of any symptoms. According to the Ministry of Health, "there is robust evidence that almost half of infections occur before the appearance of the first symptoms" (Epidemiological Bulletin No. 14). This complicates the containment and tracking of the outbreak, as does the long incubation window. Hence the suspicion that the number of infected individuals is much higher than the one actually reported. It is estimated that today in Brazil, this number may be ten times higher than official numbers, meaning we would be officially counting only 10% of cases.

The lack of precision in the actual number of infected people also appears in the nC death rate, data on which has shown an almost incomprehensible spread. In the Roadmap on Covid-19 published in March, the WHO cites several pioneering studies from China that calculated the fatality rate ranging from 1.36% to 15%! The Ministry of Health officially states that in Brazil, the rate is 6.7%, close to the world average. Italy and England are close to 14%. South Korea has stabilized close to 2%. In a single country, the statistical spread can be significant: a Harvard study estimates 7% in Michigan, whereas in Wyoming, the rate is ten times lower. Both the numerator and denominator present problems. The number of infected people can be much higher, due to the low coverage of testing. The number of deaths also seems out of balance due to underreporting. In models of exponential dynamics, such variance around a fundamental premise is unacceptable. Recently, Wuhan authorities re-counted the number of deaths attributed to Covid and increased the official numbers by 50%. Epidemiological models that used the initial official numbers had their prognosis completely compromised.

We are experiencing high levels of uncertainty and chronic doubt: the data is inconsistent, unreliable and difficult to analyze; the scope and methodology of the tests are broad; not all infected people have symptoms; not all infected people are detected; notification processes in hospitals, clinics and nursing homes differ in each country; death rates are not clear; it is still difficult to distinguish who dies with nC and of nC; the recovery process is unknown; and we don't even know if the immune response is definitive. Amid so many doubts, we need to make simplifying assumptions in order to make usable models. For example, we assume that the rate of reported cases in relation to effective cases remains constant; that the reach and methodology of testing will also be constant; that the structures of social networks are reasonably homogeneous. The reality, however, is much more complex. For example, intergenerational relations in Italy are different from in Germany. The dynamics of social interaction in large urban centers is completely different from rural regions. The models don't take into consideration the different physical restrictions around logistics and transportation infrastructure for each location.

We usually base mental models for making inferences about an uncertain on the assumption that we have good data at hand. From there, we usually employ a Bayesian conditional distribution to ascertain a range of possible results. If the percentage of infected people in a given population is x%, and the accuracy of serological tests is y%, what are the chances that a person with a positive test would have the disease? It turns out that if the input (x%) is not reliable, the result of conditional probability is not good for anything. Garbage in, garbage out, as they say (Wolpert, 2020). Similarly, the mainstream of scientific theory starts from known data to optimize viable decisions. In this paradigm, we don't have a good method if the data is not of good quality. In an environment of radical uncertainty like the one we have described, the exercise of trying to quantify precisely the costs and benefits has little value (Tuckett et al., 2020). Similarly, from the perspective of a fitness landscape model, when the environment changes radically, the strategy of looking to the nearest peak, or the optimum location, no longer makes sense. In other words, we are living in a moment when our analytical tools needs recalibrating. If we don't adjust them, unfortunately, we will continue to see some places with idle field hospitals while others are over capacity. Or essential workers with immunity not being able to leave home to go to work. Or even, public managers perplexed by the daily data, sailing without instruments and no way to anticipate the infection curve.

Likewise, we do not know how long nC will be circulating in the country and what percentage of the population will eventually develop immunity. Looking in the rearview mirror, several countries, including Brazil, recently anticipated the official date of their first death. The importance of widespread testing, which has been a common element in successful strategies to fight the outbreak, becomes increasingly evident. Testing the greatest possible number of individuals as early as possible is recommended, in order to gain real knowledge of the dynamics of the infection and optimize the effectiveness of public health actions as well as the allocation of the scarce health system resources. Unfortunately, some tests approved in Brazil and in other countries proved to be of low quality, generating statistical noise and delaying our understanding of the disease dynamics. Mass testing, contact tracing, and supervised isolation form the tripod of state-of-the-art pandemic response (Sethi et al. 2020).

Epidemiologists also remember that in extensive and long-lasting isolation processes, part of the population will not come into contact with the virus. There is a risk of infection upon returning to activities if the virus has not been completely contained. In fact, a striking characteristic common to all prior epidemics is the emergence of "secondary waves of infection." We still don't know how intense the spread of infection will be in the case of nC. But it will occur. And we don't know if there will be more than one wave. Epidemiological models indicate that prolonged and extensive lockdowns can generate susceptible populations, causing future waves of infection. Depending on the intensity of the first confinement, the final result in terms of deaths can even be worse than a successive partial containment strategy (Del Valle and Mniszewski, 2013).

This understanding is behind the milder isolation strategies used in England, New Zealand, Japan, and Sweden. In this respect, tests also play an important role in identifying the individuals who have already acquired immunity and are no longer transmitters. Advocates of gradual exit strategies say that this group should be the first to return to activities.

Psychologists Amos Tversky and Daniel Kahneman built one of the most famous and long-standing applied academic research partnerships. They are widely recognized as the architects of modern decision and judgment theory. In 1981, the two published an article in Science magazine narrating an experiment with university students that later became known as the "Asian disease" problem.

*"Imagine that the US is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows: If Program A is adopted, 200 people will be saved. If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved. Which of the two programs would you favor?*

They found that 72% of participants preferred program A to 28% who preferred program B. This means that most participants were risk averse. Saving 200 lives proves more attractive than a risky prospectus of equal expected value, in this case, a one-in-three chance of saving 600 lives.

They also presented the problem in a different format for another group of students with the following choices: If Program C is adopted 400 people will die. If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die. In this case, only 22% prefer C, with the majority choosing program D. The fact is that A and C are identical, the same goes for B and D.

The authors conclude that the inconsistent responses stem from a combination of the "framing effect" with contradictory attitudes towards choices involving gains and losses. The exercise reveals how emotional elements disturb the simple logic of a rational decision. The study design rests on the ingenuity of choosing a situation about which people have high emotional sensitivity: a public health issue involving life and death.

Almost forty years later, the imagined experiment of the "Asian disease" has come true. It is important to remember at this point that the problem proposed does not take into account the ethical merit of saving or not saving lives, since the probabilities involved are identical. This is not even discussed, and it is obvious that we cannot calculate trade-offs when we are talking about human life and suffering. We are making an earlier point. Mental confusion occurred in the simple structure of the statement, and such is the influence of our automatic reflexes and emotional influences in situations of this nature. The experiment was not only done with students. On one occasion, Tversky was invited to give a lecture for public health professionals and introduced the question to the event participants, dividing them in two groups. He found that health professionals, specialists responsible for making critical decisions during epidemics or vaccine campaigns, were also susceptible to the planning effects. They were equally swayed in a simple semantic trap.

In summary, we are facing a highly contagious virus with a particularly perverse characteristic that transforms asymptomatic carriers into infectious agents. The death rate does not appear to be as high as that of the other respiratory viruses that caused MERS and SARS (estimated at 35% and 10%, respectively). However, nC

## *Dynamo Cougar x IBX x Ibovespa Performance up to April 2020 (in R$)*

| Period | Dynamo Cougar | IBX | Ibovespa |
|---|---|---|---|
| 60 months | 94.9% | 47.1% | 43.2% |
| 36 months | 49.0% | 25.8% | 23.1% |
| 24 months | 29.4% | -4.1% | -6.5% |
| 12 months | 6.2% | -15.1% | -16.5% |
| Year to date | -23.9% | -30.1% | -30.4% |

*NAV/Share on April 30* = R$ 1,012.562469600

## *DYNAMO COUGAR x IBOVESPA*
## *(Performance – Percentage Change in US$ dollars)*

| Period | DYNAMO COUGAR* Year | DYNAMO COUGAR* Since Sep 1, 1993 | IBOVESPA** Year | IBOVESPA** Since Sep 1, 1993 |
|---|---|---|---|---|
| **1993** | 38.8% | 38.8% | 7.7% | 7.7% |
| **1994** | 245.6% | 379.5% | 62.6% | 75.1% |
| **1995** | -3.6% | 362.2% | -14.0% | 50.5% |
| **1996** | 53.6% | 609.8% | 53.2% | 130.6% |
| **1997** | -6.2% | 565.5% | 34.7% | 210.6% |
| **1998** | -19.1% | 438.1% | -38.5% | 91.0% |
| **1999** | 104.6% | 1,001.2% | 70.2% | 224.9% |
| **2000** | 3.0% | 1,034.5% | -18.3% | 165.4% |
| **2001** | -6.4% | 962.4% | -25.0% | 99.0% |
| **2002** | -7.9% | 878.9% | -45.5% | 8.5% |
| **2003** | 93.9% | 1,798.5% | 141.3% | 161.8% |
| **2004** | 64.4% | 3,020.2% | 28.2% | 235.7% |
| **2005** | 41.2% | 4,305.5% | 44.8% | 386.1% |
| **2006** | 49.8% | 6,498.3% | 45.5% | 607.5% |
| **2007** | 59.7% | 10,436.6% | 73.4% | 1,126.8% |
| **2008** | -47.1% | 5,470.1% | -55.4% | 446.5% |
| **2009** | 143.7% | 13,472.6% | 145.2% | 1,239.9% |
| **2010** | 28.1% | 17,282.0% | 5.6% | 1,331.8% |
| **2011** | -4.4% | 16,514.5% | -27.3% | 929.1% |
| **2012** | 14.0% | 18,844.6% | -1.4% | 914.5% |
| **2013** | -7.3% | 17,456.8% | -26.3% | 647.9% |
| **2014** | -6.0% | 16,401.5% | -14.4% | 540.4% |
| **2015** | -23.3% | 12,560.8% | -41.0% | 277.6% |
| **2016** | 42.4% | 17,926.4% | 66.5% | 528.6% |
| **2017** | 25.8% | 22,574.0% | 25.0% | 685.6% |
| **2018** | -8.9% | 20,567.8% | -1.8% | 671.5% |
| **2019** | 53.2% | 31,570.4% | 26.5% | 875.9% |

| 2019 | DYNAMO COUGAR* Month | DYNAMO COUGAR* Year | IBOVESPA** Month | IBOVESPA** Year |
|---|---|---|---|---|
| **JAN** | -0.1% | -0.1% | -7.1% | -7.1% |
| **FEB** | -13.0% | -13.0% | -13.1% | -19.3% |
| **MAR** | -41.2% | -48.9% | -39.3% | -51.0% |
| **APR** | 10.6% | -43.5% | 5.6% | -48.3% |

Average Net Asset Value for Dynamo Cougar
(Last 12 months): R$ 4,076,547,460

*(*) The Dynamo Cougar Fund figures are audited by Price Waterhouse and Coopers and returns net of all costs and fees, except for Adjustment of Performance Fee, if due.*

*(**) Ibovespa closing.*

is especially pathogenic in the most vulnerable individuals. Promising therapeutic approaches are emerging, although there is no perspective on vaccine development in the coming months. The good news is that the nC mutation rate is not high, which increases the chances that science and technology will be able to find more lasting solutions to combat it.

The challenge of understanding seems to increase exponentially as we move from the morphology of the virus to the pathogenesis of the disease, and from there to its epidemiology. This is because the levels of complexity grow and accumulate, beginning with the virus itself and moving to its interaction with the complex biochemical mechanism of our physiology and then into the socio-environmental dimensions that affect the transmission process. In parallel, while we move from closed systems to open realities, the precision of our instruments declines. From factual observation (virus genome) to controlled experimentation (hydroxychloroquine associated with azithromycin) to the simulations of the epidemiological models. Since the level of uncertainty increases, the quality of the judgements tends to diminish, and even more so with such sensitive emotional components at stake.

Now that we have put together these elements from outside the scope of our competences, we are in a position to explore their contiguous territories in the next Report.

*Rio de Janeiro, May 18, 2020*

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**www.dynamo.com.br**



DYNAMO

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