# The impact of the pandemic on US companies

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**Submission date:** 03-Jan-2021 12:55PM (UTC-0800)

**Submission ID:** 1482713003

**File name:** 13352_Afonso_Fernandes_Tomaz_Patr_cio_De_Mendon_a_The_impact_of_the_pandemic_on_US_companies_150146_1575343961.pdf (515.59K)

**Word count:** 6402

**Character count:** 34122

A Work Project presented as part of the requirements for the Award of a Master's degree in Management from the Nova School of Business and Economics.

# THE IMPACT OF THE PANDEMIC ON US COMPANIES

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31-12-2020

## Abstract

The pandemic plaguing the world has, by now, killed more than a million people and infected more than 70 million. It has taken over the news all around the globe and it changed millions of lives. Yet, what has been its impact on companies?

Through the elaboration of an econometric Multiple Linear Regression, this paper conducts an analysis on the impact the coronavirus pandemic has had on US companies.

The present study comprises two major findings. US companies have taken a severe hit due to this pandemic and their welfare has become more dependent on results (revenue results).



**Keywords**

Pandemic

Impact

Finance

Coronavirus

Companies

This work used resources funded by Universidade Nova de Lisboa.

## Literature Review

Before addressing the challenge of assessing the impact of the pandemic on the US corporate world, like in any study of this kind, it is crucial to evaluate what has been done on the matter in order to avoid repeating prior work, narrow the hypothesis to study and guide this paper.

Being it a very recent topic, however, there is not much academic research yet made on this specific subject. Nevertheless, there are pieces addressing the immediate impact of Covid-19 on the economy and the impact of prior pandemics, which combined, could shed a light on what this thesis might bring.

Earlier this century, the US Congressional Budget Office (2005), Jonung and Roeger (2006) for the European Commission and Sargent and James (2006) for the Canadian government department of finance, elaborated studies which gather information about the impact of previous (influenza) pandemics on the economy and predict how the next pandemic could affect it, everything in macroeconomic terms. Among these studies there are also references to the tourism sector as one of potentially most damaged sectors within pandemic times.

Regarding previous pandemics, addressing the banking sector, Gong, Jiang and Lu (2020), with the purpose of predicting what could come in 2020, showcased the impact of the H1N1 disease on banking lending finding that, the closer countries were with virus outbreaks, the larger were spreads in use and the lower were the loan amounts. Similarly, Ichev and Marinc (2018) presented evidence that in 2014-2016, there was a negative correlation between Ebola outbreaks and stock prices in the US market.

More recently, Baker, Bloom, Kost, Davis, Sammon and Viratyosin (2020) studied the stock market shock caused by the newest pandemic, which is described as unprecedent, fostered by the government-imposed restrictions on a "service-oriented economy", and is measured in stock price changes and volatility. Alternatively, also regarding this pandemic, Mirza, Naqvi, Rahat

and Rizvi (2020) provide an evaluation of European investment funds' performance from January to June of this year. Shalif, Aloui and Yarovaya (2020) briefly analyse the impact of the new coronavirus in the US stock market, As do Alfaro, Chari, Greenland and Schott (2020), making use of a different method.

Regarding the impact of coronavirus in China, which was felt earlier, Shen, Fu, Pan, Yu and Chen (2020) assessed firms' performance alteration in a regression-based approach. Taking net profit return rate as the company performance indicator. This study's highlightable conclusions, which surely serve as guidelines to the present one, are that the company's performance mutation is dependent on its revenues and on the sector it operates in.

In more descriptive terms, Nicola, Alzafi, Sohrabi, Kehrwan,Al-Jahbir, Iosifidis, Agha and Agha (2020), provide a very useful summary of the socio-economic implications of covid-19, from which this study takes special interest in the sector-specific impact of the pandemic described by the referred thesis.

Finally, in technical terms, Newbold Carlson and Thorne (2012) and Wooldridge (2012) are the books providing the main theoretical support for the creation of this academic thesis.

This study, as Shen, Fu, Pan Yu and Chen (2020), aims at assessing the impact of the current epidemic disease in the corporate world with a regression-based analysis. It provides, however, a different proposal of dependent and independent variables and possesses a different geographic scope (the US). What follows is the evaluation of the pandemic implications for the US companies by regarding its market valuation variation and an attempt to provide numerical answers to the questions posed.

## Introduction

In November 2019, in the province of Hubei, China, the first case of COVID-19 took place. Being its origin still uncertain and a very polemic topic (as written by Sarah Boseley for *The Guardian*), what is for sure is that this case would alter the way every single person on earth would live the year of 2020. Starting to spread in China, then the Asian continent, this virus eventually got to virtually every corner of the planet. COVID-19 is a highly infectious disease which has proven lethal more than a million times, being especially effective on fragile people (the elderly, asthmatics, cancer fighters, etc).

Attempting to fight the pandemic installed, rulers of this world took combined and independent measures. Borders were closed, events were cancelled, travels were reduced, etc. The world as a whole changed, these are unparalleled times where no one knows what will happen next. As most of the actions the rulers take nowadays, these measures did not come without a significant impact on the different economies and the corporate world.

As such, this study aims at evaluating the impact (or part of it) of this pandemic in the corporate environment, specifically on companies' market values. It tries to answer questions such as: was the effect of the pandemic heavier on certain sectors than on others? Or, do investors react differently to an increase in revenues whenever the pandemic is ongoing? Or even, ceteris paribus, what is the effect of the COVID-19 on the value the market assigns to a company?

This regression-based study produces two majorly important results, providing statistical evidence that the pandemic itself, isolated from other effects, has severely hit the corporate world and that it also brought additional revenue sensibility, ie, during the coronavirus outbreak, companies' values have become more reliant on their revenue volume.

## Hypothesis

Assessing the impact of the pandemic in the corporate world seems a very broad task. In fact, one wouldn't know what to look for if the question was not narrowed. As such, in this chapter come a set of hypotheses which, backed by the review made on previous literature, were thought to be interesting to study and go deeply into the kind of repercussions the pandemic has had on US companies.

### 1- Revenues

The first hypothesis to be tested, revenues are irrelevant, is the only coefficient for which a test will be proposed that is not covid-related. It does not serve the ultimate purpose of this study, assessing the impact of the pandemic in the economy but it serves the purpose of providing the model credibility and sense. Why is that?

Regarding the impact of a variable in a company's valuation, this is, in my opinion, the most straight-forward. It is, unequivocally, a sign of a firm's welfare. There are no businesses which are going well but are not selling and there are no businesses which are going poorly because sales are through the roof.

Revenues are the present, past or future cash-inflows a company receives due to its regular operations, and it is the only way for a company to be successful in the long-term. High levels of revenues are undoubtedly a positive sign for investors and are never seen as harmful for the future dividends' prediction of a firm (which is, ultimately, what defines its market value). Although it is not the only important matter, it should be for sure that, whenever controlled for all the rest, large revenues are better for a company's market capitalization than low ones.

As such, it would be a good credibility test for the model if it is able to reject that the coefficient assigned to revenues is an irrelevant or negative one.

**2- Pandemic**

Secoond hypothesis to test is the most straight-forward, it is the main goal of this study.

The economic recession brought by the decrease of socio-economic activity came with severe consequences. One of them being the decrease in investors' confidence. Investors are no longer sure about the ability of companies to generate future dividends. Moreover, generally, purchasing power has decreased, unemployment has increased and other recession-like characteristics have taken place. (See 15th reference, "The Global Economy in 2020, by The Numbers - Atlantic Council")

Therefore, besides the downfall of the companies' future returns perspectives, there is also a decline in demand for assets from the investors' part (note that these two effects are not independent). The most likely consequence, which is what will be first tested, is that, ceteris paribus, the market value of a company is lower whenever the world is going through the Covid-19 pandemic.

**3- Revenue*Pandemic**

One of the most popular words these days, which also applies to capital markets, is uncertainty. This pandemic has put everyone under a vain of uncertainty where none of us knows what happens next, what measures will authorities take, how many will be infected tomorrow or how will it affect the markets, making investors turn their selves to material results and look for some certainty in the middle of this situation. Therefore, it is expected that the pandemic

scenario makes companies more sensitive to increases/decreases in revenues, as these are the best proxy investors will have to companies' situations. This would mean that an increase in revenues during the pandemic would lead to a larger increase in market cap than it would during "normal" times, and a decrease would lead to a larger decrease in the company value.

**4- Debt*Pandemic**

The economic recession we're currently living and, according to specialists, will live in for some years, caused by the socio-economical effects of the pandemic, has put companies under an additional amount of pressure. Firms did not account for this possibility before and so, the level of indebtedness was decided based on regular scenarios. This decrease in general economic activity will most likely decrease companies' future cash in-flows and give them a hard time repaying their debt. Additionally, as referred to by Gong, Jiang and Lu (2020), credit markets have become tighter and investors look for less risky alternatives these days, which is certainly harmful for companies which will have to recur to additional debt to pay back old debt. All-in-all, besides the classical discussion about the right amount of debt to incur in, it is expected that, in pandemic times, companies with lower debt levels, ceteris paribus, have larger market values.

**5- IT*Pandemic – Hotels*Pandemic**

The hard times we currently live in have been tougher for certain sectors of the economy than others, while some companies have adapted well to the situation and were able to keep themselves alive and healthy, others, due to the nature of its businesses, have struggled with the new mobility conditions. While there are plenty of examples of companies which strived during this pandemic and exceled at digitalizing their businesses, adapting quickly to remote work ,

some firms, due to physical impossibilities have found it hard to keep business "running as usual", for companies like night clubs, restaurants, physiotherapy clinics or many others, digitalizing or becoming remote is fairly impossible.

The word mentioned above "digitalization", is, by many, considered the key for companies to prosper, or be less harmed these days (check 16th reference for *Forbes* article on digitalization). This is a factor that, naturally, puts IT companies in a favourable position. Indeed, in the US, tech company indices recorded impressive performances in an exceptionally bad year for the stock market (first two images in Appendix show the performance of a tech index and a non-tech index). On the contrary, the impossibility of remoting or digitalizing making the business epidemic-proof is a tough reality for firms which own hotels, restaurants or casinos. Backed by this reasoning, the test to be conducted now compares the severity of the hit taken by the IT sector with the one taken by the Hotels, Restaurants and Leisure sector.

Therefore, the hypothesis to be tested here is that the pandemic hit the Information Technology sector less severely than it did with the Hotels, Restaurants and Leisure sector. What is regarded in this analysis is not whether the coefficients attributed to each variable are positive or negative, the scope here is to assess whether they're different.

### 6- Healthcare.Pandemic-Transportation.Pandemic

The economic crisis that the world will experience for some time is nothing but the consequence of the health crisis it is experiencing right now. While things may have been unavoidably calmer for many firms, healthcare companies have been busier than ever, as mentioned by Nicola, Alzafi, Sohrabi, Kehrwan,Al-Jahbir, Iosifidis, Agha and Agha (2020). Hospitals have been handling new Covid-19 cases daily while carrying on with normal activity and abiding a broad set of new hygiene rules, medical clinics have been actively performing new Covid tests besides

all the kinds of analysis did before and pharmaceutical companies have, not only been part of a frenetic race for the vaccine development but also been working hard on creating/exploring drugs which can mitigate the effects of the virus to its carrier. Additionally, regarding the latest type of firms, many investors have regarded this vaccine quest almost as a horse-race, where holding stocks of the best "horse" (the vaccine owner) might prove significantly profitable at the end. This perspective has increased the demand for pharmaceutical firms' stocks (17th reference contains an article backing this rise).

Measures like closing borders, forcing quarantines, prohibiting circulation, staying home encouragement, among others, have all contributed to a significant downfall in people's mobility around the globe. Moreover, the awareness existent regarding this highly infectious virus and the risk it bears to certain groups of society has led several people to stay home more often and numerous companies to adopt the remote work modality. This decrease in mobility explained, materializes in less tourism traveling as referred to by Nicola, Alzafi, Sohrabi, Kehrwan,Al-Jahbir, Iosifidis, Agha and Agha (2020), less business traveling, less daily movement in general (images 3 to 5 in Appendix contain mobility data on the World). One of the obvious consequences is an immediate decrease in revenues in people's transportation firms, and, given the uncertainty regarding the end date of this health crisis, this can be considered a type of stock to disregard for now.

## Data

The sample chosen to represent the US companies' framework was the 500 largest firms in the country according to the S&P 500 index as of the 1st November 2020. The sample includes selected quarter data for each company for the period comprised between September 2017 and September 2020. Companies which lacked information or belonged to the banking sector were excluded.

Data in this model was extracted from a single source, Wharton Research Data Services (WRDS), more specifically, Compustat. It is a database for financial, statistical and market information for active and inactive companies around the world.

The selected variables were company fundamentals like revenues, assets, long term debt, cash and COGS (to obtain a margin), market information (to obtain the market capitalization) and some identifying information (like the GIC industry code). Additionally, a dummy variable, pandemic, was added, which evaluates whether the COVID-19 epidemic is ongoing.

Moreover, the dummy variables, which will be further addressed and explained later on, were manually computed, with the support of some basic Excel functions, using data from the model. For example, the variable "IT" was computed using the values in the column "GIC industry code", whenever the code matched the IT sector code, the variable was assigned the value 1, whenever it did not, the value assigned was 0.

**The variables**

A limitation in the Excel data analysis tool-pack (the tool utilized to compute the model), implied that the number of dependent variables were 16, the maximum allowed by the program.

The first four variables, revenues, long-term debt, assets and cash were all directly extracted from WRDS, the fifth, margin, was computed using both the revenues and COGS. Then, all the

variables left are either dummy variables or dummy variable interactions. The first, pandemic, is a simple dummy variable and will be further addressed later. The two following, which will be the aim of tests, are interactions of the pandemic variable with two of the chosen fundamentals to justify the market cap. Next, come four variables, computed using the GIC industry code extracted from the data source which take the value 1 if the company belongs to the intended sector or 0, if the company does not. Lastly, the final four variables are dummy-dummy interactions which evaluate jointly the sector and the pandemic condition.

The market cap, computed using the amount of shares per company and the share price, was chosen as the indicator of company's welfare. When comparing with revenues (the other variable considered for such purpose), market cap has the advantage of including not only company's past performance but most of all, its future return perspectives.

Table 1 contains a set of summary statistics which regard the variables referred which are useful for one to get better acquainted with the values in study.

| Table 1 - Summary Statistics | |
|---|---|
| Number of Companies Observed | 443 |
| Number of Observations | 5694 |
| Average Firm Value (million dollars) | 47785,96 |
| Average Revenue (million dollars) | 5799,972 |
| Average LT Debt (million dollars) | 10811,39 |
| Average Cash (million dollars) | 2597,006 |
| Observations Hotels Restaurants and Leisure Sector | 163 |
| Observations Transportation Sector | 194 |
| Observations IT Sector | 896 |
| Observations Health Care Sector | 774 |

## Methodology

If it was possible to test for the entire population of companies in the world, or even the US, the model would be perfect and the linear regression would provide the best possible fit. As it is not, every model computed will be no more than an estimation of the real model:

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k + \varepsilon \quad (1)$$

The most popular estimation method, the one explained by the leading piece consulted to produce this study is the Ordinary Least Squares Estimation.

As mentioned before, this model serves two purposes which are related. A first objective, which can be seen as a means to an end, is the evaluation of the influence of certain company's fundamentals/characteristics in its market capitalization, for example, what does an increase in assets mean in terms of company valuation? or by how much does the company value increase/decrease whenever there is an increase in revenues?

Attempting to explain this, as stated above, an econometric multiple linear regression model was created where these relations are calculated by estimating the coefficients, $\beta_k$, which determine the effect of the independent variables, on the dependent variable, Y. Through the Ordinary Least Squares (OLS) method, the model studied possesses an equation of the following kind:

$$MarketCap_i = \hat{\beta}_0 + \hat{\beta}_1 Assets_i + \hat{\beta}_2 Cash_i + \hat{\beta}_3 Debt_i + \hat{\beta}_4 Revenues_i + \hat{\beta}_5 Margin_i + \hat{\beta}_6 Pandemic_i + \hat{\beta}_7 Revenue * Pandemic_i + \hat{\beta}_8 Debt * Pandemic_i + \hat{\beta}_9 Hotels_i + \hat{\beta}_{10} Transportation_i + \hat{\beta}_{11} IT_i + \hat{\beta}_{12} HealthCare_i + \hat{\beta}_{13} Hotels * Pandemic_i + \hat{\beta}_{14} Transportation * Pandemic_i + \hat{\beta}_{15} IT * Pandemic_i + \hat{\beta}_{16} HealthCare * Pandemic_i \quad (2)$$

Regarding its interpretation, as mentioned before, the coefficients created measure the impact of the dependent variables on the independent variable. For instance, $\hat{\beta}_1$ measures the change in the Market Cap caused by a unit change in Assets, when controlled for $x_2$, $x_3$, etc. In mathematical terms:

$$\Delta\hat{y} = \hat{\beta}_1 \Delta x_1 \quad (3)$$

Evidently, other coefficients have the same interpretation.

The model was created via Microsoft Office Excel, using the data analysis tool. By selecting the data, this tool assigns a coefficient to every variable.

The second and ultimate purpose of this model is the creation of the dummy variable "pandemic", present in equation (2).

As stated previously, the model comprises data from various companies since Sep-2017 until Sep-2020, as such, the three quarters of 2020 that are analysed share the characteristic of being subject to a pandemic which hit the corporate (and not only) world strongly. Therefore, this variable analyses not only the impact of the pandemic itself, but also, by generating interactions with other variables, it will tell us how the pandemic hit a certain sector of the economy or how it made companies' sensitivity to increase in revenues/debt different, for example.

Having presented the model's structure, the hypothesis to test detain the following shape:

Test 1 – Revenues: Ceteris paribus, a company's market value is higher, the higher were the sales recorded in the quarter in question:

$$H_0: \beta_1 \leq 0 \quad (4)$$

$$H_1: \beta_1 > 0 \quad (5)$$

Test 2 – Pandemic: Ceteris paribus, whenever a pandemic is ongoing, a firm's market value is lower:

$$H_0: \beta_{10} \geq 0 \quad (6)$$

$$H_1: \beta_{10} < 0 \quad (7)$$

Test 3 – Revenues*Pandemic: Ceteris paribus, whenever in pandemic times, market valuations become more sensible to changes in revenues:

$$H_0: \beta_{13} \leq 0 \quad (8)$$

$$H_1: \beta_{13} > 0 \quad (9)$$

Test 4 – Debt*Pandemic: Ceteris paribus, higher levels of debt in pandemic times lead to lower company valuation:

$$H_0: \beta_{14} \geq 0 \quad (10)$$

$$H_1: \beta_{14} < 0 \quad (11)$$

Test 5 – (IT*Pandemic – Hotels*Pandemic): Ceteris paribus, IT companies were less affected than Hotels, Restaurants and Leisure firms, regarding market cap.

$$H_0: \beta_{15} \leq \beta_{13} \quad (12)$$

$$H_1: \beta_{15} > \beta_{13} \quad (13)$$

or

$$H_0: \beta_{15} - \beta_{13} \leq 0 \quad (14)$$

$$H_1: \beta_{15} - \beta_{13} > 0 \quad (15)$$

Test 6 – (Health Care*Pandemic – Transportation*Pandemic): Ceteris paribus, Health Care companies took a less severe hit by the pandemic than Transportation companies.

$$H_0: \beta_{16} \leq \beta_{14} \quad (16)$$

$$H_1: \beta_{16} > \beta_{14} \quad (17)$$

or

$$H_0: \beta_{16} - \beta_{14} \leq 0 \quad (18)$$

$$H_1: \beta_{16} - \beta_{14} > 0 \quad (19)$$

For the first 4 tests, simple t-tests are enough to assess coefficient's relevance, using the following formula, the t-stat:

$$t_{\hat{\beta}_j} = \hat{\beta}_j \,/\, se(\hat{\beta}_j) \quad (20)$$

Avoiding getting into theoretical details, this value follows a statistical distribution with *n*-*k*-1 degrees of freedom from whose table one can retrieve the value it needs to take to be relevant at the desired level of significance. Common levels of significance used are 90%, 95% and 99%.

**New Regression**

The final two tests of this paper, as mentioned when introducing the variables to study, are different from the previous as they aim the comparison between two variables and do not infer about a single parameter.

However, the usual test utilized for this kind of comparison requires a different t stat. If, for instance, the test concerned the difference between $\hat{\beta}_a$ and $\hat{\beta}_b$, the t-stat required would be:

$$t = \frac{\hat{\beta}_a - \hat{\beta}_b}{se(\hat{\beta}_a - \hat{\beta}_b)} \quad (21)$$

The problem, in this case, is that the Excel tool used to produce the model does not provide the value of the standard error of $\hat{\beta}_a - \hat{\beta}_b$, which is not the same as the difference between the standard errors of both coefficients. Nevertheless, computing it manually is also impossible as the Excel does not provide the variance covariance matrix that would be needed to do so. Therefore, the solution found to overcome the limitation of this program, was the creation of a new model by changing the variables and, thus, the coefficients.

For simplification, the explanation will still be with the hypothetic coefficients used above. If the model equation was $\hat{y} = \hat{\beta}_0 + \hat{\beta}_a x_a + \hat{\beta}_b x_b$, with the explanatory variables $x_a$ and $x_b$. The new model would predict $y$ by using the combination $x_a - x_b$ and $x_a + x_b$. Thus, the equation adjacent to the new model is:

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_c(x_a - x_b) + \hat{\beta}_d(x_a + x_b) \quad (22)$$

From where one can simply derive that:

$$\hat{\beta}_d = \frac{\hat{\beta}_a - \hat{\beta}_b}{2} \quad (23)$$

Therefore, it comes that, if $\hat{\beta}_d$ is relevant, the difference between $\hat{\beta}_a$ *and* $\hat{\beta}_b$ is also relevant. But the scope here is not only whether the difference is relevant but also if it is positive.

For the 2 following tests, a new model was created with the manipulations needed to test what was proposed previously, where only the p-value for these coefficients will be regarded. However, whenever the difference is tested, the analysis is taken back to the first model.

As such, the second model takes the following form:

$$MarketCap_i = \hat{\beta}_0 + \hat{\beta}_1 Assets_i + \hat{\beta}_2 Cash_i + \hat{\beta}_3 Debt_i + \hat{\beta}_4 Revenues_i + \hat{\beta}_5 Margin_i + \hat{\beta}_6 Pandemic_i + \hat{\beta}_7 Revenue * Pandemic_i + \hat{\beta}_8 Debt * Pandemic_i + \hat{\beta}_9 Hotels_i + \hat{\beta}_{10} Transportation_i + \hat{\beta}_{11} IT_i + \hat{\beta}_{12} HealthCare_i + \hat{\beta}_{13}(IT * Pandemic_i - Hotels * Pandemic_i) + \hat{\beta}_{14}(IT * Pandemic_i + Hotels * Pandemic_i) + \hat{\beta}_{15}(HealthCare * Pandemic_i - Transportation * Pandemic_i) + \hat{\beta}_{16}(HealthCare * Pandemic_i + Transportation * Pandemic_i) \quad (24)$$

Thus, using this second regression, tests 5 and 6 can be rewritten as:

$$H_0: \beta_{13} \leq 0 \quad (25)$$

$$H_1: \beta_{13} > 0 \quad (26)$$

And

$$H_0: \beta_{15} \leq 0 \quad (27)$$

$$H_1: \beta_{15} > 0 \quad (28)$$

## Results

Having introduced the hypothesis to test, data and methodology, it is time to take a look at the model's main results and infer some crucial statistics for the elaboration of all the tests desired.

The first table supplied by the tool is the one that follows, comprising a multitude of regression statistics from which only one will be discussed, the R squared.

Table 2 - Regression Statistics

| | |
|---|---|
| Multiple R | 0,670051114 |
| R Square | 0,448968496 |
| Adjusted R Square | 0,447415474 |
| Standard Error | 74373,48992 |
| Observations | 5694 |

The R squared, also known as coefficient of determination of a regression, indicates the proportion of the variance of the dependent variable that is explained by the independent variables. In our model, as can be seen in the table above, retrieved from the Excel file, the R-squared is 44,9%, which means that the regression model accounts for 44,9% of the variance of the response variable. Although it can seem as a fairly poor result, there is an explanation for such a low coefficient of determination and why it is not a big deal.

The reason for this mediocre result is that the model tries to predict the market capitalization of a company using past conditions while it is, in its essence, a prediction of the firm's future dividends. Although large revenues, good margins and the perfect amount of debt are surely positive signs of a company's welfare, and considered by investors in their analyses, there are other very important factors accounting for a firm's value. As it is a matter of the future, a company's market value is also influenced by factors like trends, the competition, market growth, expert's opinions, brand name, etc.

Moreover, as previously announced, the goal of this study is not to assemble the perfect multiple linear regression to predict the market cap, but to use such a model to assess the effects brought by the pandemic.

Table 3 contains the coefficients value for each regression and its statistical significance for each commonly used level. Coefficients which are significant at 99%, 95% and 90% are denoted with ***, ** and *, respectively.

Note that, except for the margin, and the dummy variables, all variables are in million dollars.

| Table 3 - Coefficients | (1) | (2) |
|---|---|---|
| Intercept | -1330,9443 | -1330,9443 |
| Assets | -0,0523** | -0,0523** |
| Cash | 4,6967*** | 4,6967*** |
| Debt | 1,0815*** | 1,0815*** |
| Revenues | 3,0790*** | 3,0790*** |
| Margin | 12730,5053*** | 12730,5053*** |
| Pandemic | -13038,3154*** | -13038,3154*** |
| Revenue.Pandemic | 1,0432*** | 1,0432*** |
| Debt.Pandemic | 0,0966 | 0,0966 |
| Hotels | 9596,0239 | 9596,0239 |
| Transportation | -1484,6189 | -1484,6189 |
| Information Technology | 26623,0504*** | 26623,0504*** |
| Healthcare | 1016,0531 | 1016,0531 |
| Hotels.Pandemic | 13361,8101 | - |
| Trans.Pandemic | -3926,4899 | - |
| IT.Pandemic | 30119,0950*** | - |
| HC.Pandemic | -1200,1585 | - |
| IT – Hotels | - | 8378,6424 |
| IT + Hotels | - | 21740,4525*** |
| HC - Transportation | - | 1363,1657 |
| HC + Transportation | - | -2563,3242 |

According to the first column of the table, and assigning numbers to the variables starting from the top, the first regression can be visualized as:

$$\hat{y} = -1330{,}9 - 0{,}05x_1 + 4{,}7x_2 + 1{,}08x_3 + 3{,}1x_4 + 12730{,}5x_5 - 13038x_6 + x_7 + 0{,}1x_8 + 9596x_9 - 1484{,}6x_{10} + 26623{,}1x_{11} + 1016{,}1x_{12} + 13361{,}8x_{13} - 3926{,}5x_{14} + 30119{,}1x_{15} - 1200{,}2x_{16} \quad (29)$$

Where:

$\hat{y}$ = Market cap (in million dollars);

$x_1$ = Assets (in million dollars) ; $x_2$ = Cash (in million dollars) ;

$x_3$ = Debt (in million dollars) ; $x_4$ = Revenues (in million dollars) ;

$x_5$ = Margin ; $x_6$ = Pandemic (dummy) ;

$x_7$ = Revenue.Pandemic (in million dollars) ; $x_8$ = Debt.Pandemic (in million dollars) ;

$x_9$ = Hotels (dummy) ; $x_{10}$ = Transportation (dummy) ;

$x_{11}$ = Information Technology (dummy) ; $x_{12}$ = Healthcare (dummy) ;

$x_{13}$ = Hotels.Pandemic (dummy) ; $x_{14}$ = Transportation.Pandemic (dummy) ;

$x_{15}$ = Assets (in million dollars) ; $x_{16}$ = Healthcare.Pandemic (dummy) ;

For the second regression, a similar equation takes place where the aforementioned changes take place. Such equation will not be written to avoid repetitions.

**Revenues**

This test, the first proposed, was just to assert the model was rightly computed. It is the only one that does not comprise the variable pandemic. As stated anteriorly, this value should be positive and the test should confirm it, as it is, unquestionably, a positive sign for investors. One could even question a model where the impact of such caption in the market value is negative or zero.

The model determined a value of 3,078992 for $\hat{\beta}_4$, meaning that for a million increase in revenues (regardless of sanitary conditions) leads to a 3 078 992$ increase in the company's market capitalization.

Being significant at all commonly used levels, this coefficient proves, beyond question, that, at least for this variable (the one justified as being the most straight-forward), in terms of predicting the explained variable, the model is pointing in the right direction.

**Pandemic**

Recalling, $\hat{\beta}_{10}$ is a coefficient which evaluates, ceteris paribus, the effect of the pandemic on a company's market value. Its value in the model is approximately -13038,3154, which, according to the model, means that whenever the pandemic is part of the reality, companies' values, when controlled for all other variables, is 13 038,3 million dollars lower.

Taking the average value of firms presented in table 1, one interpretation of this coefficient is that, whenever there is this active pandemic, the average value of a US firm falls from 47 785,96 million dollars to 34 747, 66 million dollars, representing, approximately, a 27% downfall.

This coefficient is also relevant for all the usual levels of significance, which might evidence that the analysis made when introduced hypothesis is a possible justification for the coefficient.

**Revenue.Pandemic**

The second coefficient for which an assessment was proposed is $\hat{\beta}_{11}$, the effect of a variation in revenues on the market cap, while under the pandemic vain. However, since a "Revenues" coefficient already exists, this is a complementary one.

The value assigned to this estimator by the model is 1,04319519 which means that, whenever the pandemic is ongoing, an extra million in revenues (the model is in millions by default) increases the market value by 1 043 195$, however, the existence of the aforementioned coefficient which is independent of the pandemic changes this paradigm, both coefficients have to be evaluated simultaneously. By gathering both values, a (million) increase in revenues when in pandemic times results in the following increase in market cap (the same reasoning applies for a decrease scenario):

$$\hat{\beta}_{11} + \hat{\beta}_{3} = 1{,}043195 + 3{,}078991 = 4{,}122187 \quad (30)$$

When controlled for all the non-revenue related variables, while experiencing a pandemic, a variation in the market value is equal to 4,122187 times the variation in revenues.

Putting it numerically, the average value of revenues in the sample is approximately 5 800 million dollars, resultantly, as reported by the model, on average, this caption's contribution to the market capitalization is :

$$5800 * 4{,}122187 = 23908{,}7 \text{ million dollars} \quad (31)$$

Finally, being relevant for all commonly used levels of significance suggests the analysis made when introduced the hypothesis is a possible justification for the coefficient, the valuation investors' make of firms is more sensitive to revenues in pandemic times, which might derive from the aforementioned thesis defending that investors look for material news in uncertain times.

**Debt.Pandemic**

The thesis created to justify the test to this estimator defended that it should be negative as the both the credit market was tighter and the perspectives of future revenues are weaker. However, having the model assigned a positive value to this coefficient, the theory advocated sinks immediately and testing is no longer required.

Nevertheless, by looking at the table, it is possible to see that one can neither affirm with any level of confidence that the coefficient is positive, as it is not relevant for its value as well.

**IT.Pandemic – Hotels.Pandemic**

The first step to take is to check whether the difference is positive in the first regression, which is true. Second, like what was done with the previous single parameter tests, it is necessary to check for its relevance.

The coefficient computed in the second regression shows no relevance at any of the desired levels, meaning that, although the difference is positive, more than 16 000, according to the first model, according to the second model, it is not possible to exclude the null hypothesis of it being 0, irrelevant.

**Healthcare.Pandemic-Transportation.Pandemic**

Again, first stage is to check for a positive difference between the coefficients. Once checked that the difference is positive one more time, relevance comes. Once again, the model difference shows it is not relevant for any usual level of confidence.

Note that despite both coefficients being negative in this test and both being positive in the previous, the scope of both tests was to check if the reasons advocated priorly for the positive difference between coefficients made this difference a significant one.

**Main limitations**

This study, as any other, comes with significant limitations which must be accounted for.

First main limitation (shared by a fair amount of papers) is data access, the access to different types of data (in aggregate), such as stock return, market growth, consumer perception, among others, would allow for a better prediction of the dependent variable resulting in a more accurate model.

Second limitation of this paper, which is related with the previous one, is the time constraint. Ultimately, almost every piece of data is attainable if time is unlimited. Market growth, for example, could be fetched individually for every market and would certainly enrichen the analysis.

Third limitation, already acknowledged, is the usage of the Excel for this kind of regression. Not only did it limit the number of explanatory variables used, but also did it require for hard computations that would not be needed if utilizing a different tool.

Finally, the most relevant limitation is the uncertainty. Although the response variable contains, in itself, future expectations, no one knows for sure what will happen next, what new measures will be taken and how will the disease evolve. As such, this model's main limitation is that it contains a short-term approach that can be valid or not for the long term. Rulers might tighten measures and the impact becomes more aggressive or the pandemic can be controlled and its impact become softer.

## Conclusion

Overall, it is fair to state that, with undeniable flaws and limitations, this paper serves its purpose of (broadly) assessing the impact this pandemic has had on US firms and putting numerical values to such assessment.

Although some hypothesis did not prove truthful, this piece draws two major conclusions regarding its object of study.

Firstly, it provides statistical evidence that the pandemic came with negative consequences for companies, namely damaging market values. What is relevant and interesting to point out is that this kind of analysis provides a number to this downfall. 13 038,3 million dollars is what a company's value is expected to decrease whenever the pandemic plagues the planet.

Secondly, this study produces statistical support to the idea of increased revenue sensibility of companies' market cap. According to what was found, a million increase in revenues in pandemic times leads to a 4 122 187$ increase of firm's value, comparing to a 3 078 911$ rise in regular times.

This paper's major limitation is, however, that this pandemic is not over, making it impossible to evaluate its full impact. As such, on an ending note, it is fair to state that if this study is repeated when the dust has settled, most accurate conclusions might be drawn from these strange times.

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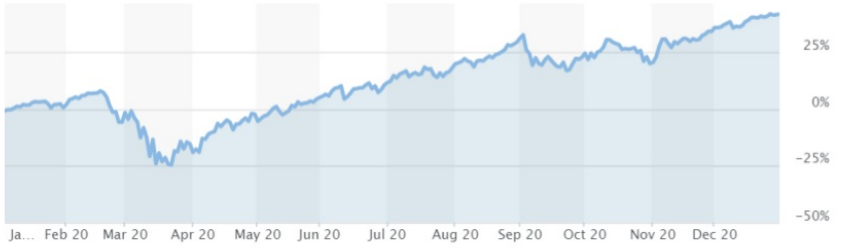
## Appendix

Image 1 – Nasdaq index performance in 2020

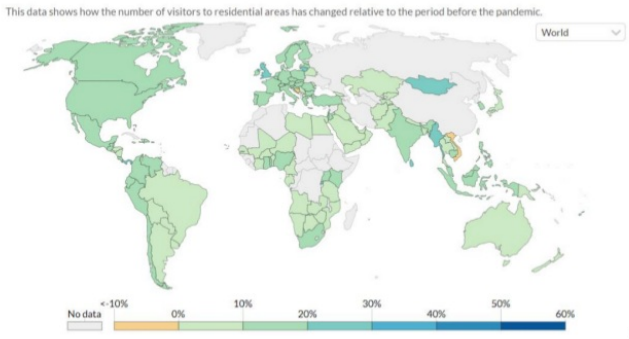



*Source: MarketWatch*

Image 2 – Dow Jones Industrial Average index performance in 2020

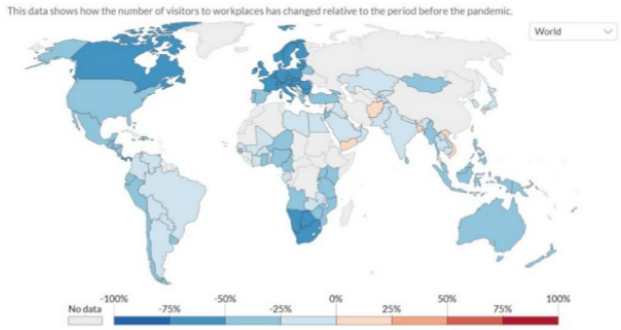

*Source: MarketWatch*

Image 3 – Residential areas visits 2020



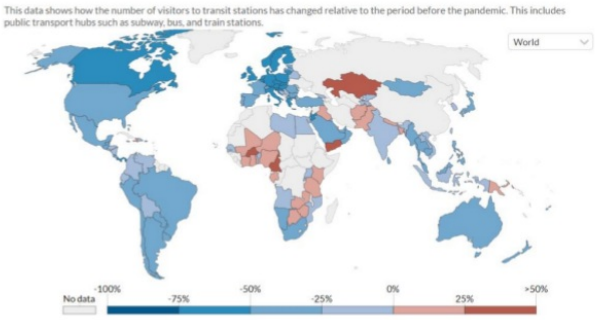

*Source: OurWorldinData*

Image 4 – Visits to workplace 2020




*Source: OurWorldinData*

Image 5 – Visits to public transportation sations 2020




*Source: OurWorldinData*

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