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Bid premiums and cumulative abnormal returns: An empirical investigation on the consequences of the Covid-19 pandemic

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ABSTRACT

Economic conditions within the market affect the likelihood of performing a business combination between firms. Indeed, the level of uncertainty during period of crisis plays a relevant role in M&A transactions. This paper is one of the first attempts to investigate the relationship between health crisis and business combinations. The findings show that while the bid premiums computed using the target's share price thirty days before the transaction announcement increase for M&A operations performed during health crises, the cumulative abnormal returns decrease.

1. Introduction

The willingness to perform a business combination is ultimately linked to the level of confidence and economic conditions within the market – i.e., in a context of a booming economy it is shown that a higher number of mergers and acquisitions are performed with respect to an economic context experiencing a contraction.

The following analysis pertains to a literature which studies the impact of uncertainty and unexpected critical events on the M&A environment and how the main actors involved react to a given economic downturn. Multiple studies underline the strong decrease in M&A volumes and value during a period of recession (Ravichandran, 2009; Rao and Reddy, 2015; BCG 2020; Emmerich and Norwitz, 2021), demonstrating that, as we experience a severe economic contraction, the impact on the M&A environment is negative. However, the current literature understudies the impact of a given economic downturn on alternative and more specific variables within the deals' context like the bid premiums and the cumulative abnormal returns. Indeed, to the best of our knowledge, besides Aguiar & Gopinath (2005), Beltratti & Paladino (2013), Yilmaz (2016), Phan & Nguyen (2017) and BCG (2020), academics and professionals did not develop structured and detailed empirical studies on the effect of a given economic crisis and its impact on the abovementioned variables. Moreover, before the current health calamity, the literature highly understudied the relationship between health crisis and business combinations. Therefore, the following study aims at filling this gap within the literature and analyzes, as research question, the impact of the Codiv-19 pandemic on the M&A context.

2. Theoretical framework development

Given the extant literature, there has been a scarce attention on how M&A transactions are impacted during a period of distressed, particularly in the context of a health crisis. Aguiar & Gopinath (2005) observed a sharp decline in acquisition prices linked to strong

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liquidity crisis experienced in the late nineties within the region. However, even though the authors observed this decline in the offering prices, the same downturn was experienced by stock market prices, leading to an unchanged value for bid premiums. Therefore, this study highlights how a given crisis within the M&A context could lead to a negative impact in terms of acquisition prices and mostly unchanged values for what concerns the level of premium offered. Additional results concerning acquisition premiums have been investigated by Weitzel et al. (2014) who found that merger premiums will be generally lower in countries experiencing a crisis. However, they do not conclude that the premiums, amid a given financial crisis, will be further suppressed, coherently with a business-as-usual scenario defined by Alquist et al. (2016). A more significant result was obtained from Phan & Nguyen (2017) who concluded that bid premiums will tend to be lower in periods of severe policy uncertainty. On the other hand, BCG (2020) in analyzing transactions performed during the great recession, found that, while volumes are lower during periods of crisis, transaction premiums will tend to be higher. In conclusion, the current literature features mixed results concerning the impact of an unexpected critical event and the level of bid premiums offered.

However, aligned with the study performed by BCG, (2020), which states that bid premiums tend to be higher in periods of high uncertainty, mainly attributable to target shareholders still demanding high valuations for their assets in a worsening market condition, we propose the following hypothesis:

H1: Given the highly price stickiness of market agents, the Covid-19 pandemic has a positive impact on the bid premiums.

Phan & Nguyen (2017), besides analyzing the impact of policy uncertainty on bid premiums, performed the same analysis on the acquirer's short term cumulative abnormal returns (CARs) having as event window the day before the transaction announcement until the day after. The result retrieved by the authors underlines a negative relationship between the CARs and the level of policy uncertainty. Besides this study, one of the main guidelines of the following stream of research is the analysis performed by Beltratti & Paladino (2013) which analyzed the impact of the great recession on cumulative abnormal returns during transaction announcements. These authors concluded that acquiring companies did not experience significant abnormal returns around announcement period. Considering the extant literature outcomes, but also the fact that there is a scarce possibility of predictability within financial markets during period of high uncertainty as during the pandemic one, we propose the following hypothesis:

H2: Given the lack of confidence and predictability within the financial markets, the short term cumulative abnormal returns are negatively impacted by the Covid-19 outbreak.

3. Research methodology

Coherently with the previously research, the hypotheses will be assessed leveraging on an OLS regression model.

3.1. Research design and variables

To understand whether a given relationship exists between the bid premiums (BP) and the Covid-19 pandemic, a linear regression model has been performed according to the following equations:

$$BP = \alpha 0 + (\alpha 1)After2020 + Control\ Variables \tag{1.1}$$

$$BP = \alpha 0 + (\alpha 1)CovidSeverityIndex + Control\ Variables \tag{1.2}$$

The dependent variables, aligned with the study of Phan & Nguyen (2017), will be the Bid Premiums computed considering the closing market price one day, seven days and thirty days before the announcement of the transaction. It is paramount to consider not only the closing price one day before the information becomes public but also consider the closing market price in the previous trading days to mitigate the possibility that the market price could be affected by a leak of private information. Indeed, given the multiple empirical studies performed, academics find out that before transaction announcement, stock prices often experience a significant variation from the norm; therefore, using a closing price several days before the announcement we are able to avoid the price being inflated to abnormal levels (Adnan and Hossain, 2016) and record a realistic measure of the premium offered.

The first independent variable is a dummy variable assuming a value of 1 if the transaction was announced after January 2020, period in which the disease started spreading on a worldwide scale.

The second independent variable aims at capturing the severity of the Covid-19 pandemic in the weeks before the announcement of the transaction. This variable was structured and computed by the authors. The proposed index was applied considering the nation in which the acquiring company operates considering the below parameters adjusted per 100.000 inhabitants:

$$Daily\ Index\ Computation = \left(\frac{1}{9}\right) * New\ Daily\ Cases + \left(\frac{4}{9}\right) * New\ Daily\ Deaths + \left(\frac{4}{9}\right) * Current\ Hospitalized\ Patients \tag{1.3}$$

The preliminary activity for building the Covid Severity Index was to gather data from the countries involved within the sample (i. e., USA, Canada, UK, Italy, Germany, Spain, Netherlands, France, and Switzerland). In the specific, from each of the above-mentioned countries, daily data was gathered concerning the number of new daily cases, new daily deaths, and new hospitalized patients.

Afterwards, a weighted average of those three values was applied using the following weights: 4/9 for the new daily deaths, 4/9 for the daily hospitalized patients and 1/9 for the new daily cases to obtain the so-called "Daily Index".

The principle behind those arbitrary weights is to capture the severity of the health crisis considering as most crucial factors the new daily deaths and the current number of hospitalized patients in each country. However, it would not make sense to consider the index value on the day in which the transaction announcement is made since the final offering price is established weeks, if not months,

before the actual announcement. Therefore, we have computed the value of the final covid severity index through a weighted average of the 21 daily indices preceding the announcement date, posing most weight on the 21st day and less on the index value immediately preceding the announcement day. This methodology was applied to better capture the market sentiment within a specific time frame. Within the Appendix A, further details on the computation are provided.

We also run other regressions having as dependent variable the CARs computed as proposed by Beltratti & Paladino (2013).

$$CARs = \alpha 0 + (\alpha 1)After2020 + Control\ Variables \tag{1.4}$$

$$CARs = \alpha 0 + (\alpha 1)CovidSeverityIndex + Control\ Variables \tag{1.5}$$

Finally, beside the above-mentioned variables, additional controls have been included to successfully isolate the effect of the outbreak within the regression models. Overall, the analyses will account for the following variables, including controls:

- Debt to Asset Ratio: measurement considering the target's total debts and total assets in the year prior to the transaction announcement (Robinson and Shane, 1990)
- Total Debt Over EBITDA: measurement computed diving the acquiring company's total debt and its EBITDA in the year prior to the transaction announcement (Masulis et al., 2007)
- Contested Bid: dummy variable discriminating whether the transaction was performed in a hostile environment or not (Damodaran, 2005)
- Majority Interest: dummy variable discriminating whether the acquiring company has gained a controlling interest in the target company (Vulpiani, 2014)
- M&A Transactions: number of transactions previously performed by the acquiring company (Ma et al., 2009)
- Growing Industry: dummy variable discriminating whether the acquiring company operates in a growing industry or not (Laamanen, 2007)
- Cross-Border Transaction: dummy variable analyzing whether the target company operates in a different country with respect to the bidder (Sovbetov, 2016).

3.2. Sample description

The sample chosen for this analysis entails 174 M&A operations having a deal size greater than 50 million US dollars (see Table 1). The reason of the cut-off established at 50 million US dollars transactions size is linked to the fact that for transactions having a lower deal size, most of the basic information was missing – e.g., form of the transaction and/or price per share paid by the acquiring company.

The selected companies are non-financial public companies which announced a business combination from January 2019 until March 2021. Obviously, only listed companies were included within the sample to derive more efficiently the data needed for the analysis and to compute the CARs of the share prices during the considered event window. Moreover, the cluster of countries[1] considered for the analysis are the United States, Canada, United Kingdom, Italy, Germany, Spain, Netherlands, France, and Switzerland.

For the following analysis, the transactions were divided according to the Industry Classification Benchmark (ICB), which provided a robust theoretical framework to reorganize the business combinations in macro areas, allowing the implementation of a more effective analysis by reducing the number of industries involved.

Considering the announcement dates distribution, it is possible to visualize that the amount of non-financial business combinations announced in 2020 is significantly lower compared to 2019 (see Fig. 1). As expected, the current social-economic crisis had a negative impact on the number of transactions executed.

Considering the results shown in Table 2, we can assess that the bid premiums computed considering the target's share price thirty days before the transaction announcement is consistently higher with respect to the other reported premiums. Moreover, the mean of the short term cumulative abnormal returns is equal to -15%, with a reported minimum value of -180% and a maximum value of 42%, preliminary indicating that most of the analyzed transactions destroyed value for shareholders in the short term.

4. Results

4.1. Bid premium regression model

Through the equations [1.1] and [1.2] underlined within the research design, the effects of the current pandemic on the bid premiums are addressed.

Six regressions were run, considering all three dependent variables capturing the level of bid premiums at different point in time (see Table 3). Moreover, regressions were performed considering whether the industry fixed effect could have a significant impact on the results. The above effect was accounted within the analysis by running the regressions including dummy variables that could capture the different industries in which the acquiring companies operate.

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[1] The cluster was composed considering the country of origin of both the target and the acquiring company.

Table 1

Sample selection process.

Announced M&A Transactions worldwide from 01/01/2019 until 15/03/2021	128,487
Less: Uncompleted Deals[2]	38,826
Less: Deals below 50 million US dollars	79,776
Less: Deals outside the pre-determined countries	4848
Less: Non-Public Acquirers and Targets	4667
Less: Financial Buyers	74
Less: Buybacks and Acquisition of remaining interest	122
Final Sample	174

[2]Among the transaction announced from 2019 onwards, we considered only the ones which have been officially completed during the considered time frame – i.e., from 01/01/2019 until 15/03/2021.
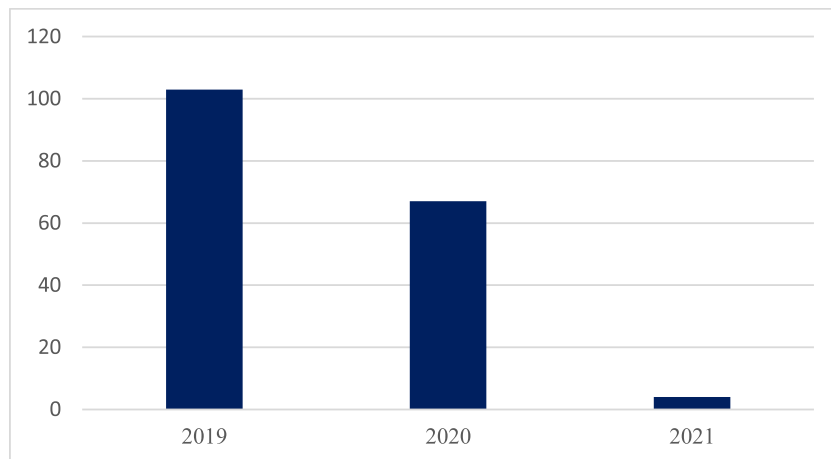

Fig. 1. Announcement years distribution.

Table 2

Statistical summary variables.

Variable	Obs.	Mean	Median	Std.Dev.	Min	Max	25pct	75pct
Bid Premium 1	174	0.33	0.20	0.54	-0.98	4.09	0.04	0.52
Bid Premium 7	174	0.40	0.24	0.58	-0.98	3.62	0.08	0.61
Bid Premium 30	174	0.50	0.31	0.77	-0.98	4.92	0.11	0.59
CARs	174	-0.15	-0.01	1.39	-18.03	0.42	-0.07	0.01
Covid Severity Index	174	5.41	5.55	4.81	0.00	21.18	0.94	7.40
Debt Over Asset	174	0.28	0.24	0.22	0.00	0.97	0.08	0.43
Debt Over EBITDA	174	2.08	1.81	1.85	0.00	8.4	0.70	2.95
M&A Transactions	174	51.64	20.00	131.26	0.00	1182.00	9.00	35.00
After 2020	174	0.40	0.00	0.49	0.00	1.00	0.00	1.00
Contested Bid	174	0.02	0.00	0.16	0.00	1.00	0.00	0.00
Majority Interest	174	0.90	1.00	0.28	0.00	1.00	1.00	1.00
Growing Industry	174	0.29	0.00	0.45	0.00	1.00	0.00	1.00
Cross-Border	174	0.24	0.00	0.42	0.00	1.00	0.00	1.00

The regressions pictured in Table 3 exhibit a positive relationship between the *After 2020* dummy variable and the level of bid premiums. The result is statistically significant as we consider the analysis performed on the premiums computed using the target's share price thirty days before the transaction announcement, supporting H1. The missing significance of BP1 and BP7 was expected given that the premiums computed using the target's share price 1 day and 7 days before the transaction announcement are more likely to be biased given their proximity to market announcement date. This first result support our hypothesis and confirms the findings of BCG (2020), inferring that during periods of recent socioeconomic crisis, premiums will tend to be higher.

Subsequently, as previously defined within the research design, we need to verify the impact of health crisis severity on the analyzed premiums. For this reason, we performed the analysis on the sub-sample of the M&A operations performed from 2020 onwards. The number of M&A transactions is 71.

Through this regression, it is possible to understand whether the severity of the pandemic had an impact on the level of bid premiums offered within a business combination or not.

Table 3

Regression table bid premium analysis coefficient (P-Value).

Variables	BP1		BP7		BP30	
After 2020	0.06 (0.94)	0.05 (0.544)	0.06 (0.45)	0.10 (0.31)	0.14 (0.19)	0.21 (0.09)*
Debt to Asset Ratio	0.02 (0.92)	-0.05 (0.80)	0.01 (0.93)	-0.02 (0.90)	0.02 (0.95)	-0.04 (0.89)
Total Debt Over EBITDA	0.01 (0.62)	0.007 (0.74)	0.01 (0.64)	0.10 (0.68)	-0.01 (0.77)	-0.02 (0.57)
Majority Interest	-0.14 (0.40)	-0.09 (0.61)	0.04 (0.80)	0.09 (0.61)	-0.09 (0.67)	-0.04 (0.86)
Contested Bid	-0.20 (0.47)	-0.20 (0.49)	-0.01 (0.96)	0.002 (0.99)	-0.05 (0.90)	-0.12 (0.78)
M&A Transactions	-0.0005 (0.86)	-0.0007 (0.85)	0.0001 (0.98)	-0.0001 (0.90)	-0.001 (0.69)	0.005 (0.92)
Growing Industry	0.26 (0.004)***	0.17 (0.42)	0.33 (0.001)***	0.16 (0.47)	0.37 (0.005)***	0.28 (0.16)
Cross-Border	0.08 (0.39)	0.09 (0.37)	0.13 (0.20)	0.13 (0.24)	0.12 (0.35)	0.09 (0.53)
Intercept	0.37 (0.47)	0.38 (0.52)	-0.13 (0.81)	-0.14 (0.81)	0.06 (0.93)	-0.38 (0.72)
Industry Fixed Effects	No	Yes	No	Yes	No	Yes
R-Squared	0.08	0.11	0.10	0.13	0.07	0.10
Observations	174	174	174	174	174	174

$+ p < 0.10$, $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$.

Consistently with the previous result, we can see that the most statistically significant values are retrieved using as response variable the bid premium computed thirty days before the transaction announcement. Moreover, it is evident from Table 4 that the result retrieved in Table 3 remains; indeed, the *Covid Severity Index* will have a positive and significant relationship with the level of bid premiums, supporting H1. To ensure the validity of the model, we conducted some robustness checks by recomputing the Covid Severity Index with different weights for deaths, hospitalized and new cases. The obtained results are consistent with the previous ones.

Considering the control variables included within the above regression analysis, the growing industry dummy variable appears to be positively related with the level of bid premium, coherently with the analysis of Laamanen (2007). Thus, when the acquiring company operates in a growing industry, the level of bid premiums tends to be higher.

Finally, considering instead cross-industry difference, while we have accounted for the various sectors involved by introducing an industry fixed effect within our regression, all the industry dummy variables included in the regression are not statistically significant, suggesting that no robust cross-industry difference exists within the analyzed sample.

4.2. CARs regression model

The impact of the newly coronavirus disease on short-term cumulative abnormal returns has been analyzed through the regression model referencing to the equations [1.4] and [1.5].

The short-term cumulative abnormal returns have a significant negative relationship with the *After 2020* dummy variable. Among the control variables, the analysis confirms the strong positive relationship between the cumulative abnormal returns and the *Majority Interest* dummy variable. Consistently with our previous argument, this result can be linked to the fact that bidders are expected to generate additional value in the long run given the acquisition of a controlling stake within the target. Finally, an inconsistent result with respect to Damodaran (2005) has been obtained for what concerns the positive relationship between the level of CARs and the *Contested Bid* dummy variable. Indeed, given the strong information asymmetries between the bidder and the target, those transactions are usually negatively perceived within the market.

The results obtained within this last regression, when the sub-sample of M&A operations that took place from 2020 onwards is

Table 4

Regression table bid premium analysis 2020 sample coefficient (P-Value).

Variables	BP1		BP7		BP30	
Covid Severity Index	0.01 (0.39)	0.02 (0.28)	0.01 (0.43)	0.01 (0.31)	0.04 (0.07)*	0.05 (0.03)**
Debt to Asset Ratio	-0.12 (0.70)	0.13 (0.72)	-0.08 (0.78)	0.21 (0.55)	0.09 (0.85)	0.48 (0.42)
Total Debt Over EBITDA	0.04 (0.17)	0.02 (0.44)	0.04 (0.24)	0.01 (0.59)	-0.02 (0.80)	-0.02 (0.75)
Majority Interest	0.18 (0.39)	0.14 (0.55)	0.12 (0.55)	0.07 (0.74)	-0.43 (0.19)	-0.29 (0.46)
Contested Bid	-0.14 (0.80)	-0.68 (0.26)	-0.02 (0.96)	-0.54 (0.34)	0.19 (0.83)	-0.30 (0.75)
M&A Transactions	0.0001 (0.83)	-0.002 (0.59)	0.0001 (0.87)	-0.001 (0.54)	-0.0008 (0.29)	-0.001 (0.19)
Growing Industry	0.26 (0.07)*	0.28 (0.07)*	0.26 (0.06)*	0.27 (0.06)*	0.30 (0.19)	0.18 (0.15)
Cross-Border	0.14 (0.35)	0.13 (0.43)	0.09 (0.53)	0.06 (0.65)	0.12 (0.19)	0.28 (0.18)
Intercept	0.07 (0.92)	-0.21 (0.84)	0.16 (0.84)	0.09 (0.92)	3.28 (0.02)	3.24 (0.07)
Industry Fixed Effects	No	Yes	No	Yes	No	Yes
R-Squared	0.11	0.28	0.09	0.28	0.18	0.31
Observations	71	71	71	71	71	71

$+ p < 0.10$, $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$.

considered, 71 M&A transactions, (see Table 6) show that concerning the *Covid Severity Index*, the variable appears to be statistically significant at 10% level, thus suggesting that the pandemic severity during the announcement period significantly impacts on the overall confidence within the financial market. The result is inconsistent with the one previously obtained within the Table 5; in fact, as we consider the entire sample, the CARs are negatively impacted by the pandemic outbreak, supporting our hypothesis, while for the reduced sample, considering the outbreak's severity, a positive relationship was found. Anyhow, given the relatively small coefficients obtained within the regression model, we can conclude that the overall influence of the Covid Severity Index is neglectable. Thus, H2 is partially supported.

To ensure the validity of the model when CAR is used as dependent variable, we conducted some robustness checks by recomputing the Covid Severity Index with different weights for deaths, hospitalized and new cases. The obtained results are consistent with the previous ones.

All the industry dummy variables included in the regression are not statistically significant, suggesting, once again, that no robust cross-industry difference exists within the analyzed sample.

5. Discussion and conclusions

Even though multiple academic studies underlined the importance of macroeconomic factors on business combinations, none of those analysis had the possibility to study a global historical event like the Covid-19 pandemic and its impact on the overall financial environment. Besides the fact that multiple studies will emerge in the following years, the above analysis aims at covering the current gap within the literature and analyze which type of relationships can be derived between the current health crisis and the M&A context. Focusing within the framework of this investigation, this study addresses one main research question: whether the bid premiums and the cumulative abnormal returns have been considerably impacted by the current pandemic. Additionally, it aims at verifying whether the severity of the outbreak and industries differences could have an impact on those measures.

Consistently with our hypothesis, the obtained relationship between the bid premiums and Covid-19 health crisis is positive.

As specified within the literature review, the level of bid premium can be affected by multiple factors that could vary according to the specific context in which the transaction is performed. We emphasized the bid premium study as a micro analysis, given the fact that the offering price is ultimately established by the acquiring company and not derived from market dynamics like in the case of the cumulative abnormal returns. Therefore, bid premium dynamics are deemed as highly volatile and peculiar to the specific context analyzed. Considering the present study outcomes, the first result is that the overall level of bid premiums offered from 2020 onwards is higher with respect to the one offered in 2019.

Indeed, the average premium paid within the pandemic period is 18% higher than the one paid in 2019. One possible explanation of this apparent inconsistency can be linked to fact that target shareholders, during periods of higher market volatility and downward pressure in revenues do not adjust their price expectations and are willing to implement a business combination only at a price which they consider appropriate and that mostly corresponds to pre-crisis evaluation, fearing that they could obtain a sub-optimal offering price (The Boston Consulting Group, 2009). Thus, even though the stock price might decrease because of the general uncertainty within the market, the offering price remains linked to a pre-crisis context, leading to an increase in the overall premium. From this argument we can also derive another explanation for the lower number of transactions; in fact, only companies willing to indulge target's shareholders and willing to pay a price considering a pre-crisis evaluation were able to ultimately perform those business combinations. Indeed, the overall number of M&A transactions is lower from 2020 onward with respect to 2019. By analyzing more in-depth the retrieved sample of deals announced in 2020, we can observe multiple transactions which involved extremely high bid premiums; one of the most important examples is the 17 billion US dollars merger between Teladoc Health Inc and Livongo Health Inc, which involved a bid premium, computed thirty days before the transaction announcement, of 103%. The premium was paid considering also the fact that the two companies are involve in a very high growing sector which gained even more importance during the pandemic: virtual health care, a combination of two of the fastest growing industries within the period – i.e., health care and

Table 5
Regression table CARs analysis total sample coefficient (P-Value).

Variables	CARs	
After 2020	-0.37 (0.09)*	-0.26 (0.07)*
Debt to Asset Ratio	0.13 (0.77)	0.22 (0.66)
Total Debt Over EBITDA	0.07 (0.19)	0.09 (0.14)
Majority Interest	1.36 (0.002)***	1.56 (0.00)***
Contested Bid	1.13 (0.002)***	1.49 (0.05)**
M&A Transactions	0.005 (0.32)	0.005 (0.56)
Growing Industry	-0.31 (0.20)	-0.16 (0.76)
Cross-Border	0.33 (0.17)	0.35 (0.19)
Intercept	-2.60 (0.05)	-2.08 (0.17)
Industry Fixed Effects	No	Yes
R-Squared	0.18	0.21
Observations	174	174

$+ p < 0.10$, $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$.

Table 6
Regression table CARs analysis 2020 sample coefficient (P-Value).

Variables	CARs	
Covid Severity Index	0.09 (0.09)*	0.08 (0.10)*
Debt to Asset Ratio	0.35 (0.76)	0.30 (0.77)
Total Debt Over EBITDA	0.16 (0.23)	-0.20 (0.16)
Majority Interest	2.68 (0.003)***	1.98 (0.02)**
Contested Bid	2.36 (0.18)	-1.88 (0.22)
M&A Transactions	-0.001 (0.04)**	-0.001 (0.07)*
Growing Industry	-0.57 (0.31)	-0.70 (0.33)
Cross-Border	0.84 (0.16)	-0.71 (0.12)
Intercept	-1.11 (0.35)	-3.87 (0.63)
Industry Fixed Effects	No	Yes
R-Squared	0.17	0.21
Observations	71	71

P-Value Below 10% (*); 5% (**); 1% (***).

technology. Finally, this positive relationship might be also linked to the fact that starting from September 2020, the overall market sentiment began to rise because of the rollout of the covid-19 vaccines; thus, even though the sample captures transactions performed during the pandemic breakout, bidders could have been negatively impacted by the strong expectations of a market expansion that ultimately leaded to higher premiums.

Additionally, this research aimed at analyzing if the severity of the pandemic breakthrough could have significantly impacted the bid premiums. Also in this case, the result is consistent with respect to the one previously obtained considering the *After 2020* dummy variable: the *Covid Severity Index* has a positive relationship with the level of bid premiums.

As far as the level of cumulative abnormal returns is concerned, the findings of this paper show that they have been negatively impacted by the current health crisis. Considering the short term cumulative abnormal returns, we were able to obtain a result consistent both with our initial hypothesis and the analyzed theoretical framework. The CARs analysis involves a macro perspective; therefore, the nature of this response variable will not depend on the arbitrary decision of the acquiring company but on the current market dynamics and how market agents react to a certain transaction announcement. The cumulative abnormal returns have been highly negatively impacted by the current health crisis. The main reason for which we observe this result is linked to a paramount concept previously underlined: synergies exploitation. The fundamental reason that triggers a business combination is connected to the additional value creation that the companies expect to create following the transaction. Therefore, if market agents expect a certain business combination to be highly accretive, in a synergistic perspective, then the reaction will be on average highly positive, given that investors will be incentivized to capture the additional value creation that the two combined entities might generate. However, the above logic will be misleading in the moment in which we account for the current health crisis. Indeed, when the overall confidence within the markets is damaged because of certain events, it will be more difficult for market agents to predict a favorable outlook of the economic environment, and thus, possible synergies generation, given the high level of volatility and business disruption. Therefore, the lack of predictability and low market confidence, caused in this case by a global pandemic, will ultimately affect how agents react to deals announcement, leading to lower cumulative abnormal returns with respect to an ordinary as-is scenario.

Considering instead the *Covid Severity Index*, the retrieved results do not support the hypothesis that the level of cumulative abnormal returns are negatively impacted by the severity of the pandemic breakthrough.

In conclusions, even though we have retrieved a significant difference between the pre-pandemic and the post-pandemic periods, a modest relation was obtained considering the severity impact, suggesting that no robust link exists between the outbreak severity in a specific moment in time and both the bid premium and the cumulative abnormal returns. Overall, the main implication of this analysis is that listed acquiring companies, in the context of high market volatility and high uncertainty, while implementing a business combination, will probably pay a higher premium with respect to the current value of the target since both the counterpart's management and shareholders will always reference a value for their entity considering a pre-crisis period. Moreover, market agents, given the overall uncertainty within the business environment, will react negatively to the transaction announcement, which could ultimately lead to negative consequence in the fulfillment of the deal itself and overall performances of the acquiring company. Therefore, to avoid a negative impact that could ultimately destroy value in the long run for the acquiring shareholders, the bidder will need to negotiate a sales and purchase agreement with the target that contemplates a realistic evaluation, accounting for the specific macroeconomics context and uncertain outlook. The company, not overpaying for the business combination, will be able to adjust market's expectations and possibly retrieve a positive reaction from investors, leading to a short-term value creation in terms of stock price.

6. Limitations and further research

One of the main limitations relies on the sample size. As previously defined within the sample section process, the total number of business combinations was obtained considering specific characteristics of the firms involved like their public status and region in which the transaction was performed. However, a straightforward approach might be to expand the sample and consider also uncompleted deals or deals involving non-public entities.

Additionally, it is relevant to underline the limitations of the *Covid Severity Index*. Indeed, world economies were all caught by surprise from the current health crisis and so their data collection systems. In fact, most of the available data on Covid-19 does not fully capture the negative market sentiment of the period, especially if we consider the initial stage of the outbreak. For example, in countries like Italy, considering the time frame from February 2020 to April 2020, the effective number of deaths have been assumed to be at least twice as high with respect to the reported numbers (Agenzia Italia, 2020). On the other hand, in the subsequent periods, as testing began to increase exponentially, countries were able to report more effectively all the relevant statistics, capturing more efficiently the severity of the coronavirus pandemic. Therefore, considering the above argument, the construction of an index based on those data will inevitably suffer from biases, leading to lower numbers in the initial stage and more realistic ones in the subsequent time. Considering this perspective, a possible solution to capture the severity of the pandemic more efficiently might be to leverage on a market sentiment index, which is generally computed considering movements within the market instead of external factors for which data, as previously stated, might be missing or not adequate to capture the authentic market agent's sentiment.

Author statement

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Term	Definition
Conceptualization	Ramazio E.
Methodology	Ramazio E.
Software	Ramazio E.
Validation	Ramazio E.
Formal analysis	Ramazio E.
Investigation	Ramazio E.
Resources	Magnanelli B.S.; Nasta L.; Ramazio E.
Data Curation	Ramazio E.
Writing - Original Draft	Ramazio E.
Writing - Review & Editing	Magnanelli B.S.; Nasta L.
Visualization	Magnanelli B.S.; Nasta L.
Supervision	Magnanelli B.S.; Nasta L.
Project administration	Magnanelli B.S.; Nasta L.

Declarations of Competing Interest

None

Appendix A

Covid Index Computation

For each country considered, number of new cases, new deaths and hospitalized patients were retrieved for a period consistent with the analyzed sample. Afterwards, those values were converted considering a rate *per 100'000,* and afterwards, the daily index was computed considering the weights previously defined. Subsequently, to obtain the measure considered within the analysis we implemented another weighted average considering each daily indexes 21 days before the transaction announcement. For the above formulation, the following excel formula was applied

$$
\begin{aligned}
&= H40*(0.15) + H39*(0.05) + H38*(0.05) + H37*(0.05) + H36*(0.05) + H35*(0.05) + H34*(0.05) + H33*(0.05) \\
&\quad + H32*(0.05) \\
&+ H31*(0.05) + H30*(0.05) + H29*(0.05) + H28*(0.05) + H27*(0.05) + H26*(0.05) + H25*(0.025) + H24*(0.025) + H23 \\
&\quad *(0.025) + H22*(0.025) + H21*(0.025) + H20*(0.025) \\
&= H40*(0.15) + H39*(0.05) + H38*(0.05) + H37*(0.05) + H36*(0.05) + H35*(0.05) + H34*(0.05) + H33*(0.05) \\
&\quad + H32*(0.05) + H31*(0.05) + H30*(0.05) + H29*(0.05) + H28*(0.05) + H27*(0.05) + H26*(0.05) + H25*(0.025) \\
&\quad + H24*(0.025) + H23*(0.025) + H22*(0.025) + H21*(0.025) + H20*(0.025)
\end{aligned}
$$

Considering the above approach, it can be observed that a heavier weight to the last value instead of daily index computed in the day of the announcement was assigned, to better capture the overall pandemic severity within the analyzed period, given also the fact that measurement that the bid premium will not be affected by the daily health statistics in the days in which the transaction is announced.

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