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The hospitality industry and COVID-19: Stock price crash risk

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Abstract
In this paper, we analyze the factors that have determined why certain companies in the hospitality industry managed to buffer themselves from the effects of COVID-19 more consistently than others. In particular, we focus on downside risk measures. We found that hotel companies quoted in the United States were the most affected and that investors were less willing to hold shares in those companies during the pandemic. We also observe that, although hotels obtained lower returns during the period of analysis, restaurants were more affected by extreme events.

Keywords
COVID-19, stock price crash risk, hospitality, performance

Introduction

COVID-19 has proven to be a real challenge for the hospitality industry. Investors are finding it difficult to anticipate the evolution of the industry, and the specter of a new SARS-2 variant or similar airborne disease does not make this any easier. The pandemic caused large swings in the stock prices of companies in the sector and increased their volatility (Mazur et al., 2021; Wang et al., 2022). In this paper, we propose to analyze the factors that have contributed to companies' relative success in managing the effects of the crisis. We will use data from companies in the hotel and restaurant sector since they have been two of the hardest hit areas of the economy (Norris et al., 2021; Cepni et al., 2023).

However, not all companies have suffered in the same way. In this paper, we seek to explain the determinants of this uneven effectiveness in cushioning shocks, emphasizing the use of extreme performance measures. We will study the elements that determined why certain companies suffered larger movements in their stock prices than others, focusing on the difference between hotels and restaurants, in particular. In Figures 1 and 2 we can see that although restaurant companies suffered,

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on average, the largest falls in their stock prices in 2020 (Figure 1), hotels experienced greater variability throughout the year (Figure 2).

In this paper, we analyze what is called the "risk of a crash" understood as stock prices moving down (see Habib et al. 2018 for an extensive literature review) using the Maximum Drawdown (MDD).

Numerous research papers have delved into and substantiated the profound influence of the COVID-19 pandemic on financial markets (see, e.g., Albulescu (2020); Akhtaruzzaman et al. (2020), and Zaremba et al. (2020)). This study contributes to the literature in a number of ways. First, it allows us to better understand why certain companies in the hospitality industry suffered huge falls in their stock prices. In particular, this study offers an in-depth analysis of the capital destruction that many investors could have suffered by investing in such stocks in times of relative calm while reverting their position in times of turbulence. Second, it evaluates the elements that allowed certain companies to avoid losses better than others. Finally, it seeks to shed light on the determinants of extreme losses, which reach a critical point in periods of heightened uncertainty.

Data and methodology

We use data on publicly traded companies from the hospitality industry (hotels and restaurants). Our dataset comprises companies from different markets including North America, Europe, Oceania, and Asia. The data was collected from Thomson Reuters Datastream, MarketScreener, and Yahoo Finance. In addition, we apply a variety of filters to our sample. Our sample has observations for all variables of interest in the pre- and COVID-19 period, which we define as occurring between January 1, 2019 and November 30, 2021. We winsorize[1] our variables at the 1% and 99% levels, respectively, to mitigate effects from outliers. After this filtering process, we are left with 62 companies (36 hotels and 26 restaurants).

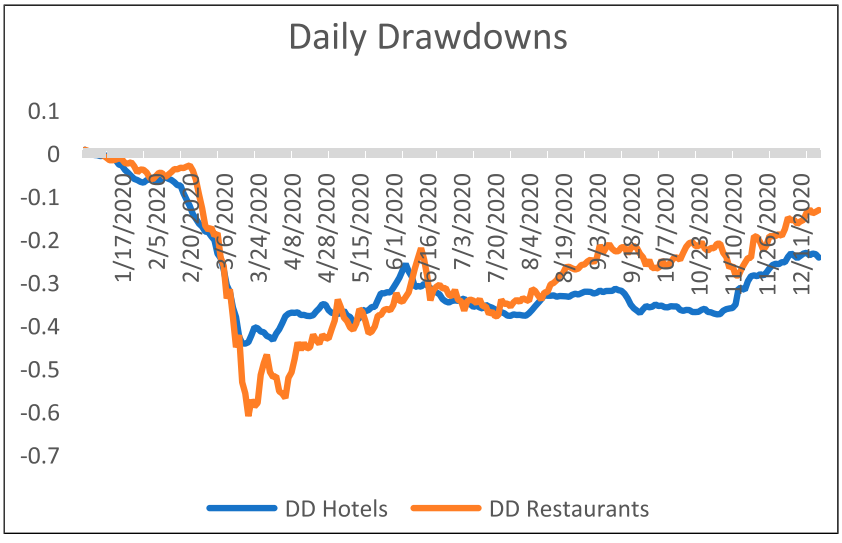

Figure 1. Daily drawdowns. Notes: This Figure presents the daily drawdowns calculated as stated in formula (1) for the average daily returns for hotels and restaurants (average across institutions of the same category) in 2020. The y-axis is measured in decimals.

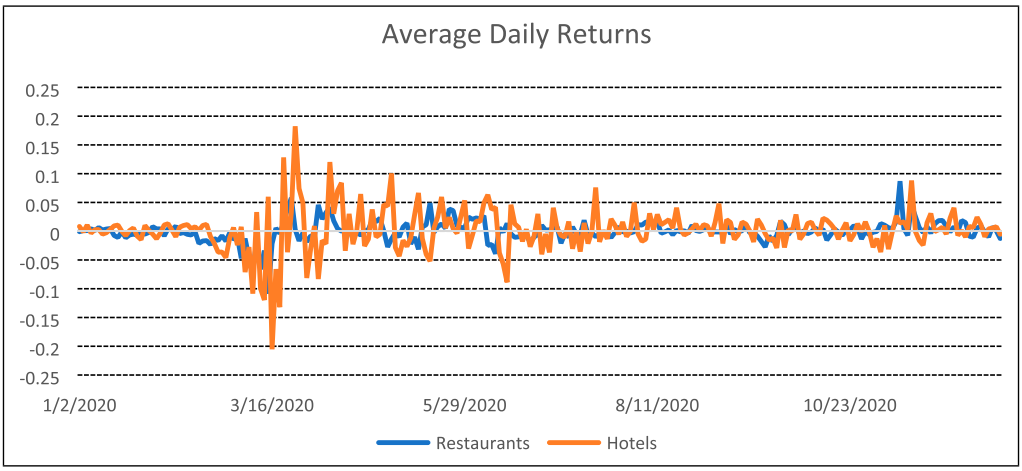

Figure 2. Average daily returns. Notes: This Figure presents the average daily returns for hotels and restaurants (average across establishments in the same category) in 2020. The *y*-axis is measured in decimals.

As in Hassan et al. (2021), our empirical approach includes two steps. First, we use daily data to calculate a series of downward measures that are going to be our dependent variables. These measures take into account the possible losses for those investors who decided to trade the stocks under analysis. Our main measure is the Maximum Drawdown.

Definition 1. (Drawdown process): For a horizon T $\in$ (0,∞), the drawdown process

$$DD(t) = \frac{P(t) - M(t)}{M(t)} \tag{1}$$

gives the maximum difference between the stock price in t and its maximum value up to time t. With,

$$M(t) = \max_{k\epsilon\{1,..,t\}} (P_k) \tag{2}$$

where P_k is the stock price at time k and $M(t)$ is the maximum share price until time k.

Definition 2. (Maximum Drawdown): It is defined as the largest price decline that an asset has ever experienced from a previous peak (maximum loss incurred from peak to valley):

$$MDD(t) = \max_{k\epsilon\{1,..,t\}} (DD_k) \tag{3}$$

and it can be interpreted as the maximum loss an investor would have experienced if he bought the asset at its highest price and sold it at its lowest value. We have calculated the Monthly Maximum Drawdown. Consequently, we have a total of 2170 observations (62 companies and 35 months).

Since we want to analyze the determinants of this measure, we use the explanatory variables with a lag. The model to be tested takes the following form:

$$y_{it} = \gamma_0 + \gamma_1 X_{it-l} + \gamma_2 \mu_s + \gamma_3 \delta_r + \gamma_4 COVID_t + \gamma_5 CWI_t + \varepsilon_{it} \tag{4}$$

where the dependent variable y_{it} is going to be the monthly maximum drawdown (MDD) for hotels and restaurants. X_{it-l} is a vector of variables that include the MDD and returns with a 1-year lag, the volatility with a 6-month lag, and the Standard and Poor's 500 Index (SP500) with a 1-month lag. μ_s is a sectoral dummy that takes the value of 1 for hotels and 0 otherwise, while δ_r is a regional dummy (that takes the value 1 for the U.S.). Finally, we have dummies for COVID, which takes the value of 1 for those months starting in March 2020 and for the COVID-19 wave (CW1 taking a value of 1 for March–June 2020 and 0 otherwise, while CW2 takes the value of 1 for the period November 2020–May 2021 and 0 otherwise).[2] Consequently, the full model has 1,426 observations (given the 1-year lag we have 23 months for 62 companies). These variables are extensively used in the literature (e.g., Hassan et al., 2021).

Empirical findings

Table 1 presents the descriptive statistics for different variables. We can observe that the total returns were higher for restaurants than hotels in our sample and that this is also true for the coefficient of variation (return per unit of volatility). However, the maximum loss (MDD) was higher (more negative) for restaurants than hotels. This shows that although returns were lower for investors in the hotel industry, extreme events were more significant for investors in the restaurant industry.

In Tables 2–4, we analyze the determinants of extreme events focusing on MDD. We observe that the more risky the asset before COVID-19, the less prone it was to suffer from extreme events during COVID-19. Furthermore, those companies suffering higher MDD 1 year before the crisis or higher volatilities 6 months before the crisis suffered less during the COVID-19 period (note that a negative parameter for the L12.MDD means it moved in the opposite direction while a positive parameter for volatility means that an increase in pass volatility reduces the possibility of suffering extreme shocks during the COVID-19 period) and that the impact was also less extreme for companies with higher

Table 1. Descriptive statistics.

		Variable	Obs	Mean	Std. Dev	Min	Max
Whole period	Total	MDD	2170	−0.102	0.095	−0.811	0
		Volat	2170	0.119	0.095	0.023	1.086
		Returns	2170	0.015	0.142	−1.36	0.7
	Hotels	MDD	1190	−0.098	0.09	−0.811	0
		Volat	1190	0.11	0.083	0.023	1.086
		Returns	1190	0.008	0.143	−1.36	0.7
	Restaurants	MDD	980	−0.107	0.099	−0.694	−0.006
		Volat	980	0.129	0.106	0.024	0.932
		Returns	980	0.022	0.14	−0.742	0.561
COVID-19	Total	MDD	1302	−0.124	0.107	−0.737	0
		Volat	1302	0.145	0.108	0.023	1.086
		Returns	1302	0.02	0.165	−1.36	0.7
	Hotels	MDD	714	−0.118	0.101	−0.737	0
		Volat	714	0.133	0.093	0.023	1.086
		Returns	714	0.012	0.168	−1.36	0.7
	Restaurants	MDD	588	−0.131	0.114	−0.694	−0.006
		Volat	588	0.159	0.123	0.028	0.932
		Returns	588	0.029	0.163	−0.742	0.561

Table 2. MDD as the dependent variable (whole sample).

Dependent variable: MDD	Model 1	Model 2	Model 3
L12.MDD	−0.206*** (0.03)	−0.073** (0.03)	−0.147*** (0.03)
L12.Returns	0.048** (0.02)	0.003 (0.02)	0.047* (0.02)
L6.Volat	0.234*** (0.02)	0.084*** (0.02)	0.184*** (0.02)
L.SP500	0.890*** (0.04)	0.710*** (0.04)	0.852*** (0.04)
COVID	−0.075*** (0.01)		
COVIDW1		−0.108*** (0.01)	
COVIDW2			0.022*** (0.01)
_cons	−0.122*** (0.01)	−0.133*** (0.01)	−0.183*** (0.01)
R-sqr	0.344	0.438	0.31
Nobs	1426	1426	1426
Prob (F-stat)	0.00***	0.00***	0.00***

Notes: Reported results of panel estimations for equation (4) with heteroskedasticity and autocorrelation corrected (HAC). The L. operator presents the number of monthly lags (L12. represents a 1-year lag while L6. a 6-month lag).
*** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 3. MDD as the dependent variable (Hotels vs Hotels in the U.S.).

	Hotels		Hotels and US	
Dependent variable: MDD	Model 4	Model 5	Model 7	Model 8
L12.MDD	−0.256*** (0.04)	−0.217*** (0.04)	−0.311*** (0.05)	−0.245*** (0.06)
L12.Returns	0.055* (0.03)	0.060* (0.03)	0.007 (0.04)	0.052 (0.04)
L6.Volat	0.190*** (0.03)	0.146*** (0.03)	0.256*** (0.04)	0.172*** (0.05)
L.SP500	0.751*** (0.05)	0.720*** (0.05)	1.026*** (0.09)	0.977*** (0.10)
COVID	−0.050*** (0.01)		−0.117*** (0.02)	
COVIDW2		0.020** (0.01)		0.029* (0.01)
_cons	−0.135*** (0.01)	−0.176*** (0.01)	−0.125*** (0.02)	−0.219*** (0.01)
R-sqr	0.282	0.269	0.484	0.413
Nobs	782	782	253	253
Prob (F-stat)	0.00***	0.00***	0.00***	0.00***

Notes: Reported results of panel estimations for equation (4) with heteroskedasticity and autocorrelation corrected (HAC).
*** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

returns before the crisis. We also observe that the impact was worse during the first wave of COVID-19 (COVIDW1 in model 2) than during the second wave (COVIDW2 in model 3, where the parameter is even positive but close to 0). Finally, note that an increase in market returns (SP500) reduces the impact on MDD—although this effect was lower during the first wave of the pandemic.

In Table 3, models 4 and 5 analyze the case of hotels in general, while models 6 and 7 focus on hotels in the United States. We observe a similar pattern to the one seen for the whole group, except that returns before COVID-19 were not significant for hotels in the U.S. What is remarkable is that those hotels in the U.S. that suffered extreme events before the crisis were those that better managed to navigate the crisis versus the whole sample. Moreover, the correlation with the SP500 also increased during this period.

Table 4. MDD as the dependent variable (Restaurants vs Restaurants in the U.S.).

	Restaurants		Restaurants and US	
Dependent variable: MDD	Model 9	Model 10	Model 11	Model 12
L12.MDD	−0.165*** (0.04)	−0.079* (0.04)	−0.160*** (0.04)	−0.073 (0.04)
L12.Returns	0.051* (0.02)	0.044 (0.03)	0.048 (0.03)	0.039 (0.03)
L6.Volat	0.273*** (0.03)	0.216*** (0.03)	0.271*** (0.03)	0.212*** (0.03)
L.SP500	1.066*** (0.06)	1.021*** (0.06)	1.074*** (0.06)	1.028*** (0.07)
COVID	−0.106*** (0.01)		−0.109*** (0.01)	
COVIDW2		0.025** (0.01)		0.025** (0.01)
_cons	−0.108*** (0.01)	−0.192*** (0.01)	−0.107*** (0.01)	−0.194*** (0.01)
R-sqr	0.44	0.373	0.435	0.366
Nobs	644	644	598	598
Prob (F-stat)	0.00***	0.00***	0.00***	0.00***

Notes: Reported results of panel estimations for equation 4 with heteroskedasticity and autocorrelation corrected (HAC). *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Finally, Table 4 presents the case of Restaurants in general (models 8 and 9) and in the U.S. in particular (models 10 and 11). We observe that the sign of parameters is similar, but the impact of pass returns and volatility is more significant. The impact of the first wave was not significantly different from the impact of the whole COVID period when the sample was split and consequently not included in Tables 2 and 4.[3] We can also observe that restaurants react more to changes in the overall market than hotels.

Concluding remarks

In this paper, we shed new light on the implications of a shareholder's decision to hang on to a stock during times of crisis like a pandemic, focusing on downside risk.

In particular, we found that companies that were willing to engage in more risky activities before COVID-19 were less affected by the crisis. Even if the volatility of those assets was not necessarily lower during the crisis, the downside risk was lower. We also observe that although hotels suffered bigger losses during the period of analysis, restaurants were more affected by extreme events. Finally, we found that during the first wave of COVID-19 share prices dropped more than during both the second wave of COVID-19 and the entire pandemic.

Our results are extremely important for those investors who are averse to extreme events. We provide some hints that can be useful when evaluating where to invest. It is important to recognize that our results might be biased due to limitations in the database and the fact that COVID-19 was still an ongoing problem while writing this paper.

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Notes

1. Procedure of substituting extreme values within statistical data, undertaken to mitigate the influence of those outliers on subsequent calculations.
2. We thank an Anonymous referee for suggesting this structure.
3. We have also controlled for operating leverage, measured as in Novy-Marx, 2011, but it is not significant.

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