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COVID-19 effect on herding behaviour in European capital markets

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ABSTRACT

This article investigates whether COVID-19 pandemic had an effect on herding behaviour in Europe. Using a sample from the stock exchanges of France (Paris), Germany (Frankfurt), Italy (Milan), United Kingdom (London) and Spain (Madrid), over the period from January 03, 2000 to June 19, 2020, we found robust evidence that COVID-19 pandemic increased herding behaviour in the capital markets of Europe.

1. Introduction

The COVID-19 outbreak in Wuhan (China) in December 2019 has infected over 21 million people and caused nearly 766.000 deaths globally as of August 15, 2020 (Center for Systems Science and Engineering at Johns Hopkins University). The virus spread rapidly around the globe. The first confirmed case in Europe was on January, 24th in France and spreading its roots to other countries such as Germany, on January, 27th; Italy, on January, 30th; the UK, on January, 31th; and Spain, on January, 31th, (Georgeou and Hawksley, 2020).

The existing literature is limited on how pandemics impact financial markets (Goodell, 2020). Al-Awadhi et al. (2020) report that daily growth in total confirmed cases and in the total number of deaths caused by COVID-19 impacted negatively on stock returns of 1579 stocks of companies included in the Hang Seng Index and Shanghai Stock Exchange Composite Index over the period from January 10 to March 16, 2020. Similarly, Ali et al. (2020) show that in countries such as the US, UK, Germany and South Korea stock market volatility increased significantly from the epidemic (December 2019 to March 10, 2020) to the pandemic period (post March 10, 20202). Mazur et al. (2020) find that natural gas, food, healthcare, and software stocks earn high positive returns whereas equity values in petroleum, real estate, entertainment, and hospitality sectors fall dramatically for 1,500 firms of the Standard and Poor's for the month of March 2020. In this context, an aspect not investigated so far is whether COVID-19 has an effect on herding behaviour.

Herding behaviour is a process where investors imitate the actions of others (Hirshleifer and Hong, 2003). COVID-19 may affect herding behaviour in two directions. First, investors faced with the decline of the economy and medical and social uncertainty, consider the information available to maintain and / or invest in capital markets on the basis of their beliefs, or second, they take into account other agents who are more informed and follow their behaviour. In the latter case, the most informed agents, knowing the behaviour of the least informed, could carry out strategies to arbitrate the market for their own benefit and to the detriment of others. Given the above, we investigate whether the COVID-19 pandemic increases herding behaviour in capital markets in Europe.

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Table 1
Descriptive statistics.

		N° Obs.	Mean	Std. Dev.	Min	Max
PSE	CSAD	4837	0,0105	0,0049	0,0028	0,0440
Before COVID-19	$R_{m,t}$		0,0003	0,0132	-0,0889	0,0950
PSE	CSAD	103	0,0183	0,0098	0,0058	0,0536
After COVID-19	$R_{m,t}$		-0,0007	0,0264	-0,1068	0,0856
FSE	CSAD	4639	0,0099	0,0052	0,0000	0,0496
Before COVID-19	$R_{m,t}$		0,0002	0,0139	-0,1001	0,1141
FSE	CSAD	98	0,0148	0,0064	0,0059	0,0414
After COVID-19	$R_{m,t}$		-0,0013	0,0298	-0,1099	0,0947
ISE	CSAD	4580	0,0117	0,0056	0,0028	0,0845
Before COVID-19	$R_{m,t}$		0,0000	0,0156	-0,1195	0,1236
ISE	CSAD	99	0,0178	0,0087	0,0075	0,0433
After COVID-19	$R_{m,t}$		-0,0016	0,0319	-0,1662	0,0831
LSE	CSAD	4740	0,0105	0,0050	0,0029	0,0575
Before COVID-19	$R_{m,t}$		0,0002	0,0112	-0,0893	0,0984
LSE	CSAD	97	0,0193	0,0098	0,0058	0,0544
After COVID-19	$R_{m,t}$		-0,0007	0,0243	-0,1051	0,0748
MSE	CSAD	4819	0,0101	0,0046	0,0026	0,0529
Before COVID-19	$R_{m,t}$		0,0002	0,0131	-0,0929	0,1130
MSE	CSAD	98	0,0195	0,0108	0,0063	0,0549
After COVID-19	$R_{m,t}$		-0,0009	0,0277	-0,1453	0,0717

The paper proceeds as follows. Section 2 introduces the data and methodology. Section 3 presents the empirical results. Section 4 concludes the article.

2. Data and methodology

2.1. Data

We collect data on stock prices for firms listed on the CAC 40 Index (France), DAX 30 Index (Germany), FTSE MIB (Italy), FTSE 100 Index (United Kingdom), Ibex 35 Index (Spain) over the period from January 03, 2000 to June 19, 2020[1]. We concentrate on these markets because these were the first countries to report COVID-19 in Europe[2].

The level of herding is more evident when daily data is used (Tan et al., 2008). Thus, this study uses daily stock returns data calculated as $R_{it} = (P_{it} - P_{it-1})/P_{it-1}$. The final sample is 4940, 4737, 4679, 4837 and 4917 observations for the Paris Stock Exchange (PSE), Frankfurt Stock Exchange (FSE), Italian Stock Exchange (ISE), London Stock Exchange (LSE) and Madrid Stock Exchange (MES) respectively.

2.2. Methodology

As in other studies (Mobarek et al., 2014; Tan et al., 2008) we use the return dispersion method. The calculation of the return dispersion measure requires the calculation of an average market portfolio return $R_{m,t}$. We use the equally-weighted average of stock returns as a proxy for $R_{m,t}$. Specifically, to detect herding behaviour the model proposed by Chang et al. (2000) is used, which is a modification of the model proposed by Christie and Huang (1995), Chang et al. (2000) suggest using the following cross-sectional absolute deviation (CSAD) model:

$$CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 (R_{m,t})^2 + \varepsilon_t \tag{1}$$

where $R_{m,t}$is the market return (equal-weighted average stock return) and CSADt is a measure of return dispersion calculated as:

$$CSAD_{m,t} = \frac{1}{N}\sum_{i=1}^{N} |R_{i,t} - R_{m,t}| \tag{2}$$

where $|R_{m,t}|$ and $R_{i,t}$ are the absolute value of market return and individual stock return of stock *i*, respectively. Specifically, to assess the effect of covid-19 on herding we used the following specification:

[1] Shares that did not have complete price and volume data for the sample period were eliminated.

[2] The first COVID-19 case in France was identified in Bordeaux on 24 January. In Germany it was reported on 27 January in the Federal state of Bavaria; in Italy Chinese tourists were diagnosed on 30 January on board a cruise ship; in the United Kingdom the first cases were reported on 31 January in the city of York; and in Spain the first patient with COVID-19 was identified on 31 January in La Gomera (Georgeou and Hawksley, 2020).

Table 2
COVID-19 effect on herding behaviour in European markets

	General Model	Panel A: France $R_{m,t}>0$	$R_{m,t}<0$	$\sigma^{HIGH} > \sigma^{MA}_{t-30}$	$Vol^{HIGH} > Vol^{MA}_{t-30}$	$Vol^{LOW} > Vol^{MA}_{t-30}$	General Model	Panel B: Germany $R_{m,t}>0$	$R_{m,t}<0$	$\sigma^{HIGH} > \sigma^{MA}_{t-30}$	$Vol^{HIGH} > Vol^{MA}_{t-30}$	$Vol^{LOW} > Vol^{MA}_{t-30}$
ϒ1	0.553***	0.663***	0.437***	0.528***	0.364***	0.743***	0.365***	0.472***	0.241***	0.343***	0.296***	0.468***
	(0.033)	(0.050)	(0.044)	(0.040)	(0.045)	(0.049)	(0.034)	(0.052)	(0.048)	(0.044)	(0.044)	(0.073)
ϒ2	0.208***	0.240***	0.190***	0.178***	0.127***	0.265***	0.229***	0.261***	0.203***	0.216***	0.163***	0.157***
	(0.013)	(0.017)	(0.019)	(0.019)	(0.019)	(0.018)	(0.012)	(0.017)	(0.018)	(0.019)	(0.021)	(0.018)
ϒ3	**-2.085*****	**-2.578*****	**-1.190***	**-1.930*****	**-0.353**	**-3.778*****	**-1.693*****	**-2.205*****	**-0.674**	**-1.582*****	**-1.054***	**-2.943***
	(0.517)	**(0.917)**	**(0.642)**	**(0.622)**	**(0.662)**	**(0.921)**	**(0.486)**	**(0.832)**	**(0.624)**	**(0.611)**	**(0.574)**	**(1.531)**
ϒ4	1.842***	1.979***	1.338***	1.906***	2.798***	1.179***	1.311***	1.206***	1.395***	1.286***	1.899***	1.908***
	(0.268)	(0.341)	(0.428)	(0.357)	(0.356)	(0.436)	(0.229)	(0.303)	(0.348)	(0.312)	(0.347)	(0.428)
α	0.008***	0.008***	0.008***	0.009***	0.009***	0.007***	0.008***	0.007***	0.008***	0.008***	0.008***	0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	4,940	2,597	2,343	2,435	2,262	2,678	4,736	2,505	2,231	2,340	1,491	2,145
R-squared	0.349	0.407	0.292	0.348	0.327	0.363	0.328	0.356	0.308	0.320	0.326	0.222
t-stat1 (H0:ϒ1=ϒ2)	239.7***	160.2***	85.07***	110.1***	47.89***	193.1***	206.4***	145.3***	69.28***	83.83***	44.53***	50.95***
t-stat1 (H0:ϒ3=ϒ4)	33.56***	21.88***	6.979***	20.67***	31.47***	193.1***	23.64***	12.11***	8.890***	12.79***	17.66***	12.29***

	General Model	Panel C: Italy $R_{m,t}>0$	$R_{m,t}<0$	$\sigma^{HIGH} > \sigma^{MA}_{t-30}$	$Vol^{HIGH} > Vol^{MA}_{t-30}$	$Vol^{LOW} > Vol^{MA}_{t-30}$	General Model	Panel D: United Kingdom $R_{m,t}>0$	$R_{m,t}<0$	$\sigma^{HIGH} > \sigma^{MA}_{t-30}$	$Vol^{HIGH} > Vol^{MA}_{t-30}$	$Vol^{LOW} > Vol^{MA}_{t-30}$
ϒ1	0.445***	0.577***	0.311***	0.398***	0.384***	0.490***	0.717***	0.768***	0.592***	0.679***	0.626***	0.716***
	(0.027)	(0.052)	(0.037)	(0.032)	(0.038)	(0.056)	(0.037)	(0.061)	(0.050)	(0.045)	(0.054)	(0.058)
ϒ2	0.202***	0.252***	0.153***	0.189***	0.230***	0.163***	0.251***	0.288***	0.217***	0.211***	0.207***	0.261***
	(0.012)	(0.016)	(0.017)	(0.018)	(0.017)	(0.018)	(0.015)	(0.020)	(0.022)	(0.022)	(0.023)	(0.019)
ϒ3	**-2.055*****	**-2.638*****	**-1.243*****	**-1.778*****	**-1.672*****	**-2.128***	**-4.596*****	**-2.890****	**-3.771*****	**-4.305*****	**-4.171*****	**-2.583****
	(0.260)	(0.880)	(0.312)	(0.305)	(0.316)	(1.126)	**(0.603)**	**(1.323)**	**(0.727)**	**(0.724)**	**(0.783)**	**(1.214)**
ϒ4	1.714***	1.090***	2.370***	1.630***	1.213***	2.559***	1.787***	1.697***	1.839***	2.036***	1.744***	2.578***
	(0.202)	(0.277)	(0.293)	(0.267)	(0.256)	(0.338)	(0.320)	(0.411)	(0.504)	(0.419)	(0.467)	(0.437)
α	0.009***	0.009***	0.009***	0.010***	0.009***	0.009***	0.008***	0.008***	0.009***	0.009***	0.009***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	4,679	2,443	2,236	2,203	2,156	2,523	4,837	2,551	2,286	2,477	2,203	2,634
R-squared	0.359	0.380	0.350	0.371	0.371	0.354	0.314	0.356	0.276	0.309	0.248	0.387
t-stat1 (H0:ϒ1=ϒ2)	245.8***	161.2***	65.14***	110.7***	131.2***	70.97***	292.5***	162.3***	103.3***	138.6***	95.53***	150.9***
t-stat1 (H0:ϒ3=ϒ4)	71.85***	13.06***	42.95***	39.51***	27.08***	31.38***	47.03***	11.42***	21.19***	31.87***	22.42***	20.33***

	General Model	Panel E: Spain $R_{m,t}>0$	$R_{m,t}<0$	$\sigma^{HIGH} > \sigma^{MA}_{t-30}$	$Vol^{HIGH} > Vol^{MA}_{t-30}$	$Vol^{LOW} > Vol^{MA}_{t-30}$
ϒ1	0.621***	0.716***	0.411***	0.549***	0.424***	0.764***
	(0.037)	(0.073)	(0.048)	(0.048)	(0.056)	(0.071)
ϒ2	-0.299***	-0.333**	-0.370***	-0.501***	-0.484***	-0.362***
	(0.082)	(0.139)	(0.107)	(0.118)	(0.127)	(0.130)
ϒ3	**-3.614*****	**-1.979**	**-2.237*****	**-3.118*****	**-2.271*****	**-3.344****

(*continued on next page*)

Table 2 (*continued*)

	General	Panel A: France					General	Panel B: Germany				
	Model	$R_{m,t}>0$	$R_{m,t}<0$	$\sigma^{HIGH}> \sigma^{MA}{}_{t-30}$	$Vol^{HIGH}> Vol^{MA}{}_{t-30}$	$Vol^{LOW}> Vol^{MA}{}_{t-30}$	Model	$R_{m,t}>0$	$R_{m,t}<0$	$\sigma^{HIGH}> \sigma^{MA}{}_{t-30}$	$Vol^{HIGH}> Vol^{MA}{}_{t-30}$	$Vol^{LOW}> Vol^{MA}{}_{t-30}$
	(0.384)	(1.361)	(0.442)	(0.481)	(0.512)	(1.498)						
ϒ4	21.077***	27.398***	21.814***	24.568***	24.087***	34.437***						
	(3.268)	(7.001)	(3.860)	(4.413)	(4.517)	(7.671)						
α	0.010***	0.010***	0.010***	0.011***	0.012***	0.009***						
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)						
Obs.	629	354	275	350	266	363						
R-squared	0.465	0.579	0.394	0.472	0.378	0.602						
t-stat1												
(H0:ϒ1=ϒ2)	201.8***	76.40***	59.31***	120.1***	57.11***	87.69***						
t-stat1												
(H0:ϒ3=ϒ4)	79.36***	10.68***	35.02***	47.25***	30.59***	15.21***						

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

$$CSAD_t = \alpha + \gamma_1 D^{covid}|R_{m,t}| + \gamma_2(1 - D^{covid})|R_{m,t}| + \gamma_3 D^{covid}(R_{m,t})^2 + \gamma_4(1 - D^{covid})(R_{m,t})^2 + \varepsilon_t \quad (3)$$

The covid-dummy (Dcovid) equals one from January 24, 2020, to France; January 27, 2020, to Germany; January 30, 2020, to Italy; and January 31, 2020, to United Kingdom and Spain; and zero before that. Eq. (3) is used to assess the presence of herding in Europe before and after the reporting of the first case of COVID-19. Significantly negative values of γ_3 and $\gamma_4$would indicate the presence of herding following (before) of COVID-19.

To assess the robustness of the results we utilized different periods (2001.01.30-2020.06.12; 2010.01.04-2020.06.12; 2015.01.05-2020.06.12; 2018.01.05-2020.06.12). In addition, we consider three effects used in the literature that can affect herding behaviour: asymmetric effects of market return, high and low volatility states and domestic market trading volume (Tan et al., 2008; Mobarek et al., 2014). In the first case, we examine whether there is any asymmetry in herd behaviour when the market is rising or falling, pre and post COVID-19. In the second case, we consider high volatility when the observed volatility becomes higher than the moving average of volatility over the previous 30 days and low volatility when it does not exceed the moving average over the same period (Chang et al. 2000). The volatility is calculated as the standard deviation of market return times the square root of 252 trading days. In the third case we calculate for each market as the sum of the daily volumes of all listed stocks in that market.

3. Empirical analysis

3.1. Descriptive statistics

Table 1 reports the descriptive statistics for the CSAD measure and the average market return, calculated using both equal weights for each of sample markets. Results in Table 1 show that for all stock exchanges the mean values and standard deviations of CSAD are higher after COVID-19. A higher mean value suggests significantly higher market variations across stock returns. A higher standard deviation may suggest that markets have unusual cross-sectional variations due to unexpected events (Chiang and Zheng, 2010).

3.2. Testing effect of COVID-19 on herding behaviour in Europe

Table 2 reports the results of estimating the Eq. (3) over the period from January 02, 2018 to June 19, 2020, in Europe markets. Column (1) of each panel reports the results of the general model for each European market. We found in all countries a negative and statistically significant estimated coefficient ϒ3. The results are robust to different tests: column 2 and 3 in every panel indicate asymmetric effects of market return ($R_{m,t}$>0 and $R_{m,t}$<0 respectively); column 4 in every panel indicates high volatility state (σHIGH>σMAt-30)[3]; and column 5 and 6 in every panel indicate asymmetric effects of domestic market trading volume (Vol^{HIGH}>Vol^{MA}_{t-30} and Vol^{LOW}>Vol^{MA}_{t-30} respectively). The results show strong evidence that COVID-19 increased herding behaviour in European capital markets.

4. Conclusion

COVID-19 is a pandemic that has affected the world in various dimensions. Research on how this type of pandemic affects financial markets is limited and recent. In this article we investigate whether the COVID-19 pandemic had an effect on herding behaviour in Europe. Using a sample from the stock prices for firms listed on the CAC 40 Index (France), DAX 30 Index (Germany), FTSE MIB (Italy), FTSE 100 Index (United Kingdom), Ibex 35 Index (Spain) over the period from January 03, 2000 to June 19, 2020 we found robust evidence that COVID-19 pandemic increase herding behaviour in capital markets of Europe.

The results could be explained by less informed investors following more informed ones in a clear example of herding behaviour which in turn led to the erratic behaviour of the capital markets. Fear and uncertainty over the effects of the pandemic would drive the less informed agents to abandon their beliefs and follow the more informed ones.

CRediT authorship contribution statement

Christian Espinosa-Méndez: Conceptualization, Methodology, Software, Data curation, Formal analysis, Writing - original draft, Visualization, Investigation, Validation, Writing - review & editing. **Jose Arias:** Data curation, Data curation, Visualization, Investigation, Validation, Writing - review & editing.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2020.101787.

[3] In the case of low volatility, the number of observations is not sufficient to make robust estimates.

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