

**Online Appendix for “Infected Markets: Novel Coronavirus, Government Interventions, and
Stock Return Volatility around the Globe”**

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Abstract

The Online Appendix provides additional exhibits for the study. Table A1 presents the constructions of asset pricing factors used in the study. Table A2 demonstrates the statistical properties of the factor returns. Table A3 summarizes all the variables employed in the study. Table A4 displays correlation coefficients between these variables. Finally, Figure A1 shows factor performance through time.

Table A1. Construction of Asset Pricing Factors Used in the Study

The table presents the calculation procedures of the asset pricing factors used in the study. The procedures depart from the original studies of Fama-French (1993) and Carhart (1997) in several ways. First, due to the limited size of our universe, we use single sorts on the return predictive signal (e.g., market value, momentum) rather than two-way sorts on the signal and market value. Second, for momentum, we do not drop the most recent month from the estimation period because the equity indices do not display the short-run reversal effect (Zaremba, Long, and Karathanasopoulos 2019). Third, following numerous country-level asset pricing studies, we use the earnings-to-price ratio rather than the book-to-market ratio to form the high-minus-low factor, as this valuation measure provides better coverage (e.g., Umutlu 2015).

Asset pricing factor	Acronym	Calculation details
Market	MKT	MKT, the excess return on the market, is the value-weighted return of all the indices in the sample on day t minus the risk-free rate, i.e., the one-month U.S. T-Bill return.
Small Minus Big	SMB	We rank all the indices on their total stock market capitalization in U.S. dollars on day $t-1$. The small-minus-big (SMB) factor return is represented by the return on a zero-investment portfolio buying (selling) 30% of the indices with the lowest (highest) market capitalization.
High Minus Low	HML	We rank all the indices on their earnings-to-price (E/P) ratio on day t , where E/P is the total stock market capitalization of an index divided by a trailing 12-month aggregated net profit. The high-minus-low (HML) factor return is represented by the return on a zero-investment portfolio buying (selling) 30% of the indices with the highest (lowest) E/P ratio.
Winners Minus Losers	WML	We rank all the indices on their trailing 250-trading day total returns. The winners-minus-losers (WML) factor return is represented by the return on a zero-investment portfolio buying (selling) the indices with 30% of the highest (lowest) past returns.

Table A2. Statistical Properties of Factor Returns

The table reports the performance of the asset pricing factors used in this study: market excess return (MKT), high minus low (HML), small minus big (SMB), and winners minus losers (WML). The detailed factor construction method is presented in Table A1 in the Online Appendix and the study period is 1 January – 3 April 2020. The values in parentheses are *t*-statistics and the asterisks *, **, and *** indicate statistical significance at the 5%, 1%, and 0.1% levels, respectively. Panel A demonstrates basic descriptive statistics, and Panel B presents Pearson's product-moment pairwise correlation coefficients.

	MKT	HML	SMB	WML
<i>Panel A: Descriptive statistics</i>				
Average	-0.61 (-1.77)	-0.06 (-0.17)	-0.11 (-0.60)	0.10 (0.32)
Standard deviation	2.62	1.99	1.86	2.18
Minimum	-9.40	-6.32	-7.47	-5.99
Maximum	7.66	5.27	4.13	7.17
Skewness	-0.47	-0.28	-1.06	0.09
Kurtosis	3.20	2.03	3.05	1.38
<i>Panel B: Correlation coefficients</i>				
HML		-0.45*** (-4.12)	-0.88*** (-15.13)	0.63*** (6.60)
SMB			0.69*** (7.80)	-0.71*** (-8.16)
WML				-0.78*** (-10.14)

Table A3. Variables Used in the Study

The table presents the variables used in this research. “Variable” indicates the symbol used in the study. “Data source” denotes the source of the original data utilized to calculate the variable.

Variable	Name	Computation details	Data source
<i>Volatility indicators</i>			
log R	Absolute return	Logarithm of an absolute daily return on day t .	Datastream
log RR _{CAPM}	CAPM residual	Logarithm of an absolute residual return from the CAPM model on day t .	Datastream
log RR _{FF}	FF (1993) residual	Logarithm of an absolute residual return from the three-factor model of Fama and French (1993) on day t .	Datastream
log RR _{AMP}	AMP (2013) residual	Logarithm of an absolute residual return from the three-factor model of Asness, Moskowitz, and Pedersen (2013) on day t .	Datastream
log RR _{CAPM}	CAR (1997) residual	Logarithm of an absolute residual return from the four-factor model of Carhart (1997) on day t .	Datastream
<i>Government policy response indicators</i>			
SI	Stringency index	COVID-19 Government Response Stringency Index (Stringency Index) on day t aggregated based on different government non-pharmaceutical interventions and rescaled to create a score between 0 and 100.	Oxford COVID-19 Government Response Tracker
PR1	School closing	Variable taking a value of 0 when no measures are in place on day t , 1 when school closing is recommended, and 2 when it is required.	Oxford COVID-19 Government Response Tracker
PR2	Workplace closing	Variable taking a value of 0 when no measures are in place on day t , 1 when workplace closing is recommended, and 2 when it is required.	Oxford COVID-19 Government Response Tracker
PR3	Cancelled public events	Variable taking a value of 0 when no measures are in place on day t , 1 when cancelling public events is recommended, and 2 when it is required.	Oxford COVID-19 Government Response Tracker
PR4	Closed public transport	Variable taking a value of 0 when no measures are in place on day t , 1 when the closing of public transport is recommended, and 2 when it is required.	Oxford COVID-19 Government Response Tracker
PR5	Public information campaigns	Variable taking the value of 1 if COVID-19 public information campaign is running in the country on day t , or 0 otherwise.	Oxford COVID-19 Government Response Tracker
PR6	Restrictions on internal movement	Variable taking a value of 0 when no measures are in place on day t , 1 when restrictions on internal movement are recommended, and 2 when they are required.	Oxford COVID-19 Government Response Tracker
PR7	International travel controls	Variable taking a value of 0 when no measures are in place on day t , 1 when screening is applied, 2 when there is also a policy on quarantine on high-risk regions, and 3 when travelling to high-risk regions is banned.	Oxford COVID-19 Government Response Tracker
<i>Control variables</i>			
log(TV)	Trading volume	Logarithm of dollar trading volume (quantity of stocks times their price) traded on day t expressed in U.S. dollars.	Datastream
log(MV)	Market capitalization	Logarithm of the market value of the broad index portfolio on day $t-1$ expressed in U.S. dollars.	Datastream
log(PE)	P/E ratio	Logarithm of the ratio of current price to 12-month trailing earnings per share.	Datastream
INF	COVID-19 cases	The daily change of the total number of confirmed COVID-19 cases in a given country on day t .	European Centre for Disease Prevention and Control
DTH	COVID-19 deaths	The daily change of the total number of deaths resulting from COVID-19 in a given country on day t .	European Centre for Disease Prevention and Control
ShortBan	Short-selling ban	Variable taking a value of 1 when short-selling is banned on day t , and 0 otherwise.	European Securities and Markets Authority
ShortNote	Short-selling notification	Variable taking a value of 1 if on day t investors are obliged to report short positions exceeding 0.1% of the company's share capital to a local supervisory authority.	European Securities and Markets Authority

Table A4. Statistical Properties of the Variables

The table presents the Pearson’s product-moment pairwise correlation coefficients between all the variables considered in the study: the logarithms of absolute daily returns ($\log|R|$), as well as logarithms absolute residual returns from four different models: CAPM ($\log|RR_{CAPM}|$), the Fama-French (1993) model ($\log|RR_{FF}|$), the Asness, Moskowitz, and Pedersen (2013) model ($\log|RR_{AMP}|$), or the Carhart (1997) model ($\log|RR_{CAR}|$). Government Policy Response Stringency Index (SI) and its sub-components reflecting different interventions: school closing ($PR1$), workplace closing ($PR2$), cancelling of public events ($PR3$), closing of public transportation ($PR4$), public information campaigns ($PR5$), restrictions of internal movement ($PR6$), and international travel controls ($PR7$); the logarithm of daily dollar trading volume expressed in USD ($\log(TV)$), the logarithm of market value in USD ($\log(MV)$), the logarithm of market-wide PE ratio ($\log(PE)$), daily changes in numbers of new COVID-19 infections and deaths (ΔINF , ΔDTH); $ShortBan$ indicates short-selling ban, and $ShortNote$ indicates a requirement to notify large short position to a local market regulator.

	$\log R $	$\log RR_{CAPM} $	$\log RR_{FF} $	$\log RR_{AMP} $	$\log RR_{CAR} $	SI	$PR1$	$PR2$	$PR3$	$PR4$	$PR5$	$PR6$	$PR7$	$\log(TV)$	$\log(MV)$	$\log(PE)$	ΔINF	ΔDTH	$ShortBan$	
$\log RR_{CAPM} $	0.58																			
$\log RR_{FF} $	0.53	0.73																		
$\log RR_{AMP} $	0.53	0.70	0.88																	
$\log RR_{CAR} $	0.52	0.74	0.83	0.91																
SI	0.31	0.32	0.29	0.29	0.29															
$PR1$	0.29	0.29	0.26	0.26	0.27	0.90														
$PR2$	0.23	0.25	0.21	0.21	0.22	0.83	0.78													
$PR3$	0.33	0.32	0.28	0.28	0.29	0.90	0.85	0.75												
$PR4$	0.10	0.15	0.13	0.15	0.16	0.63	0.55	0.65	0.53											
$PR5$	0.28	0.28	0.27	0.26	0.26	0.73	0.55	0.46	0.60	0.32										
$PR6$	0.23	0.23	0.22	0.22	0.22	0.83	0.78	0.72	0.77	0.57	0.50									
$PR7$	0.28	0.27	0.26	0.24	0.24	0.81	0.66	0.53	0.69	0.36	0.64	0.59								
$\log(TV)$	0.19	0.08	0.07	0.04	0.03	0.11	0.09	0.07	0.12	-0.01	0.14	0.04	0.19							
$\log(MV)$	0.08	-0.03	-0.03	-0.05	-0.07	0.00	-0.01	-0.03	0.02	-0.09	0.04	-0.04	0.10	0.92						
$\log(PE)$	-0.06	-0.09	-0.09	-0.10	-0.09	-0.22	-0.20	-0.17	-0.22	-0.22	-0.12	-0.20	-0.14	0.31	0.35					
ΔINF	0.08	0.04	0.02	0.01	0.01	0.22	0.20	0.21	0.23	0.12	0.13	0.27	0.15	0.15	0.16	0.01				
ΔDTH	0.05	0.03	0.02	0.02	0.02	0.22	0.19	0.23	0.20	0.15	0.12	0.25	0.13	0.12	0.11	-0.01	0.74			
$ShortBan$	0.07	0.05	0.04	0.06	0.06	0.23	0.20	0.21	0.20	0.14	0.12	0.23	0.15	0.07	0.04	-0.05	0.24	0.40		
$ShortNote$	0.16	0.14	0.09	0.11	0.11	0.42	0.38	0.37	0.42	0.24	0.24	0.33	0.28	-0.06	-0.11	-0.17	0.18	0.23	0.42	

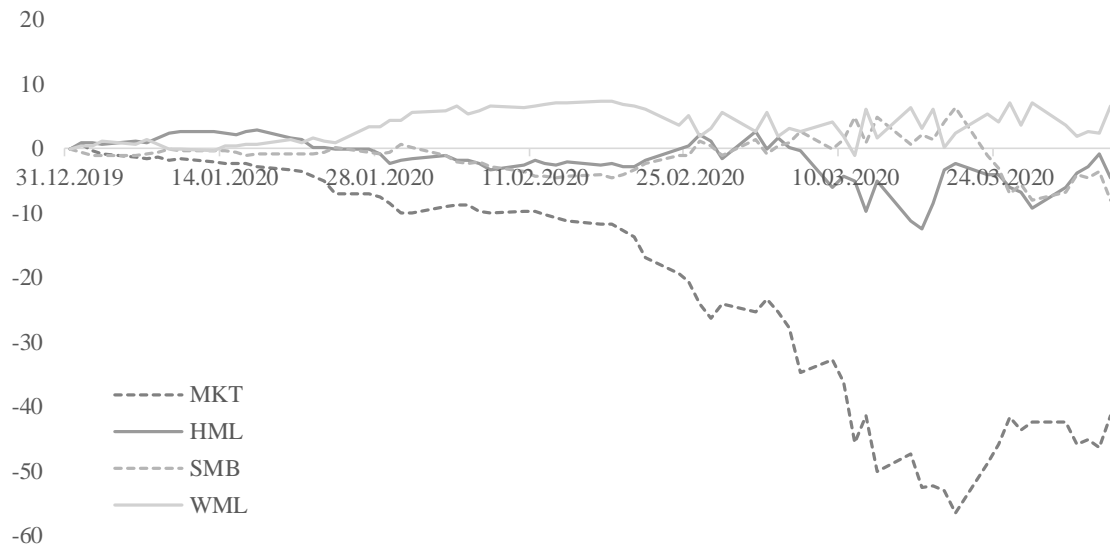


Figure A1. Statistical Properties of Factor Returns

The figure presents cumulative returns on the asset pricing factors used in this study: market excess return (MKT), high minus low (HML), small minus big (SMB), and winners minus losers (WML). The detailed factor construction method is presented in Table A1 in the Online Appendix and the study period is 1 January – 3 April 2020. The factors are cumulated additively and expressed in percentage.

References

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