The Unprecedented Stock Market Reaction to COVID-19

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Abstract. No previous infectious disease outbreak, including the Spanish Flu, has impacted the stock market as powerfully as the COVID-19 pandemic. We use text-based methods to develop this point with respect to large daily stock market moves back to 1900 and with respect to overall stock market volatility back to 1985. We also argue that policy responses to the COVID-19 pandemic provide the most compelling explanation for its unprecedented stock market imact.

As the Novel Coronavirus (COVID-19) spread from a regional crisis in China's Hubei Province to a global pandemic, equities plummeted and market volatility rocketed upwards around the world. In the United States, recent volatility levels rival or surpass those last seen in October 1987 and December 2008 and, before that, in late 1929 and the early 1930s (Figure 1). Motivated by these observations, we consider the role of COVID-19 developments in recent stock market behavior and draw comparisons to previous infectious disease outbreaks.

To quantify the role of news about infectious disease outbreaks, we use automated and human readings of newspaper articles. Looking back to 1985, we find no other infectious disease outbreak that had more than a tiny effect on U.S. stock market volatility. Looking back to 1900, we find not a single instance in which contemporary newspaper accounts attributed a large daily market move to pandemic-related developments. That includes the Spanish Flu of 1918-20, which killed an estimated 2.0 percent of the world's population (Barro, Ursua and Weng, 2020). In striking contrast, news related to COVID-19 developments is overwhelmingly the dominant driver of large daily U.S. stock market moves since 24 February 2020.

Characterizing Daily Stock Market Jumps

In Baker, Bloom, Davis and Sammon (2019), we examine next-day newspaper explanations for each daily move in the U.S. stock market greater than 2.5 percent, up or down. By this criterion, there were 1,129 stock market jumps from 2 January 1900 to 24 March 2020. Jump days account for 3.5% of all trading days and 47% of total squared daily return variation.

To characterize these jumps, we read the lead article about each jump in next-day (or same-evening) newspapers to classify the journalist's explanation into one of 16 categories, which include Macroeconomic News and Outlook, Government Spending, Monetary Policy, Unknown or No Explanation Offered, and Other – Specify. Our coding guide in Baker, Bloom, Davis and Sammon (2018) describes the methodology in detail.

Table 1 draws on our classification effort to underscore the unprecedented impact of the COVID-19 pandemic on the U.S. stock market. In the period before 24 February 2020 – spanning 120 years and more than 1,100 jumps – contemporary journalistic accounts attributed not a single daily stock market jump to infectious disease outbreaks or policy responses to such outbreaks.[1] Perhaps surprisingly, even the Spanish Flu fails to register in next-day journalistic explanations for large daily stock market moves.

Data for the past month tell a dramatically different story. From 24 February to 24 March 2020, there were 22 trading days and 18 market jumps – more than any other period in history with the same number of trading days. Jump frequency during this period is 23 times the average pace since 1900. Moreover, next-day newspaper accounts attribute 15 or 16 of the 18 jumps to news about COVID-19 developments and policy responses to the pandemic.[2] In short, no previous infectious disease episode led to daily stock market swings that even remotely resemble the response in the past month to COVID-19 developments.

Quantifying the Contribution of COVID-19 to U.S. Stock Market Volatility

As in Baker, Bloom, Davis, and Kost (2019), we use a mechanized approach to quantify the role of COVID-19 and other infectious diseases in U.S. stock market volatility. In a first step, BBDK calculate the monthly fraction of articles in 11 major US newspapers that contain (a) terms related to the economy, (b) terms related to equity markets, and (c) terms related to market volatility. We multiplicatively rescale this monthly series to match the mean value of the VIX

[1] Originally, we did not record whether journalistic accounts attributed specific jumps to policy responses to infectious disease outbreaks. After the COVID-19 pandemic, we reread lead newspaper articles about stock market jumps from January 1918 to December 1920. There were 32 jumps during these years, 23 from March 1918 to June 1920. None attributed a jump to policy responses to the Spanish Flu pandemic.

[2] The *New York Times* offered no clear explanation for the downward jump on 20 March, while the *Wall Street Journal* attributed it to pandemic-related policy responses. Both papers attributed the upward jump on 4 March to Elections and Political Transitions (i.e., Biden's strong showing in primary elections) and the downward jump on 9 March 2020 to Commodity Markets. Both papers attributed all other jumps since 24 February to COVID-19 developments or policy responses thereto.

since 1985. Figure 2 plots our resulting newspaper-based Equity Market Volatility (EMV) tracker alongside the VIX itself. As the figure shows, our EMV tracker performs well in the sense of mirroring the time-series behavior of implied stock market volatility. The same is true with respect to realized stock market volatility.

In a second step, we identify the subset of EMV articles that contain one or more terms related to COVID-19 or other infectious diseases. Specifically, we flag EMV articles that mention one of the following terms: epidemic, pandemic, virus, flu, disease, coronavirus, MERS, SARS, Ebola, H5N1, or H1N1. Multiplying the fraction of EMV articles that contain one of these terms by our EMV tracker yields our Infectious Disease EMV tracker displayed in Figure 3. The inset portion of Figure 3 displays the results of the same quantification exercise at a weekly frequency.

Figure 3 establishes three points. First, before the COVID-19 pandemic, no infectious disease outbreak made a sizable contribution to U.S. stock market volatility. The 2003 SARS epidemic and the 2015 Ebola epidemic led to modest, short-lived spikes in volatility, and the Bird Flu and Swine Flu epidemics barely registered. Second, the COVID-19 pandemic drove the tremendous surge in stock market volatility since late February. Recall from Figure 1 that this surge led to the third highest realized volatility peak since 1900. So, the volatility peak is extraordinarily high by historical standards (Figure 1), and it's almost entirely triggered by COVID-19 developments, including policy responses to the pandemic. Third, the COVID-19 volatility surge took off in the fourth week of February 2020.

Table 2 provides more information about newspaper coverage of various infectious disease outbreaks since 1985. For each episode, we report the mean value of our Infectious Disease EMV tracker, the fraction of EMV articles that contains one of our infectious disease terms (as listed above), and the fraction of articles about Economic Policy Uncertainty (EPU) that contains one of those terms. Here, we use the EPU index developed by Baker, Bloom and Davis (2016). The bottom row shows averages for the full period from January 1985 to March 2020.

By these metrics, the early-phase impact of COVID-19 looks similar to the impact of other infectious disease outbreaks in the past 35 years. In January 2020, for example, the Infectious Disease EMV tracker is only modestly elevated, and the percent of EMV and EPU

articles that discuss COVID-19 developments is roughly in line with previous experiences during the SARS and Ebola epidemics. By February, however, COVID-19 developments began to dominate newspaper coverage of stock market volatility and figure prominently in newspaper discussions of economic policy uncertainty. By March, COVID-19 developments receive attention in more than 90% of all newspaper discussions of market volatility and policy uncertainty. These data confirm the unprecedented impact of the COVID-19 pandemic.

Why Such a Powerful Stock Market Impact?

Why have COVID-19 developments exerted such powerful effects on the stock market since late February? Clearly, the current pandemic has grave implications for public health and for the economy. So, part of the answer surely lies in the severity of the pandemic, the apparent ease with which COVID-19 spreads, and the non-negligible mortality rate among those who contract the virus. Still, we think this answer is highly incomplete. Like Barro, Ursua and Weng (2020), we regard the mortality rates experienced during the Spanish Flu as a worst-case upper bound on the potential mortality induced by COVID-19. Yet, as Table 1 shows, the Spanish Flu did not trigger even a small number of daily stock market jumps.

A second potential answer, particularly in comparison to the Spanish Flu, is that information about pandemics is richer and diffuses much more rapidly now than a century earlier.[3] According to this explanation, the stock market impact of the COVID-19 pandemic is more temporally concentrated and more likely to trigger daily stock market jumps and high stock market volatility than Spanish Flu developments a century earlier. Here as well, there may be something to this explanation, but it is also highly incomplete. As Velde (2020) discusses, the negative stock market impact of the Spanish Flu was fairly modest even over time spans of several months. Hence, explanations that stress greater information availability and its more rapid diffusion do not take us very far in rationalizing the huge stock market drop since 24 February.

A third explanation stresses the interconnectedness of the modern economy: the commonplace nature of long-distance travel and, in Europe, cross-border commuting; decades of falling communication costs, falling transport costs and, until recently, falling tariffs; dense,

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[3] As a related point, the first wave of the Spanish Flu occurred during World War I when news about the true extent of the outbreak was censored (Honigsbaum, 2013).

geographically expansive supply chains; and the ubiquity of just-in-time inventory systems, which are highly vulnerable to supply disruptions.[4] In addition, the structure of the economy has shifted over time to services, many of which involve face-to-face interactions. An abrupt uptake of voluntary and compulsory social distancing practices brings a sharp drop in demand for such services. Again, there is merit in this explanation, but it also strikes us as insufficient on its own to explain the stock market reaction.

That brings us to behavioral and policy reactions to the COVID-19 pandemic. As Baldwin (2020) puts it, "COVID-19 and the containment policies have directly and massively reduced the flow of labour to businesses. The result has been a sudden and massive reduction in the output of goods and services." Voluntary adoption of social distancing practices has also played a significant role. Current containment efforts are much more extensive and widespread than similar efforts in the past, including during the Spanish Flu. They also have more potent effects in the modern economy for reasons sketched above. In our view, the policy response to the COVID-19 pandemic provides the most compelling explanation for its unprecedented impact on the stock market. Oddly enough, this somewhat mirrors the impact of COVID-19 in more severe cases, where an autoimmune response generates a cytokine storm, damaging lung tissue (Shi et al., 2020)

The healthcare rationale for travel restrictions, social distancing mandates, and other containment policies is clear. These policies also bring great economic damage. Recent stock market behavior is an early and visible reflection of the (expected) damage. There is an urgent need to address the health crisis created by COVID-19 while shifting to less sweeping containment policies that do not strangle the economy, as argued by Cochrane (2020), Dewatripont et al. (2020), Ichino et al. (2020) and Monras (2020), among others.
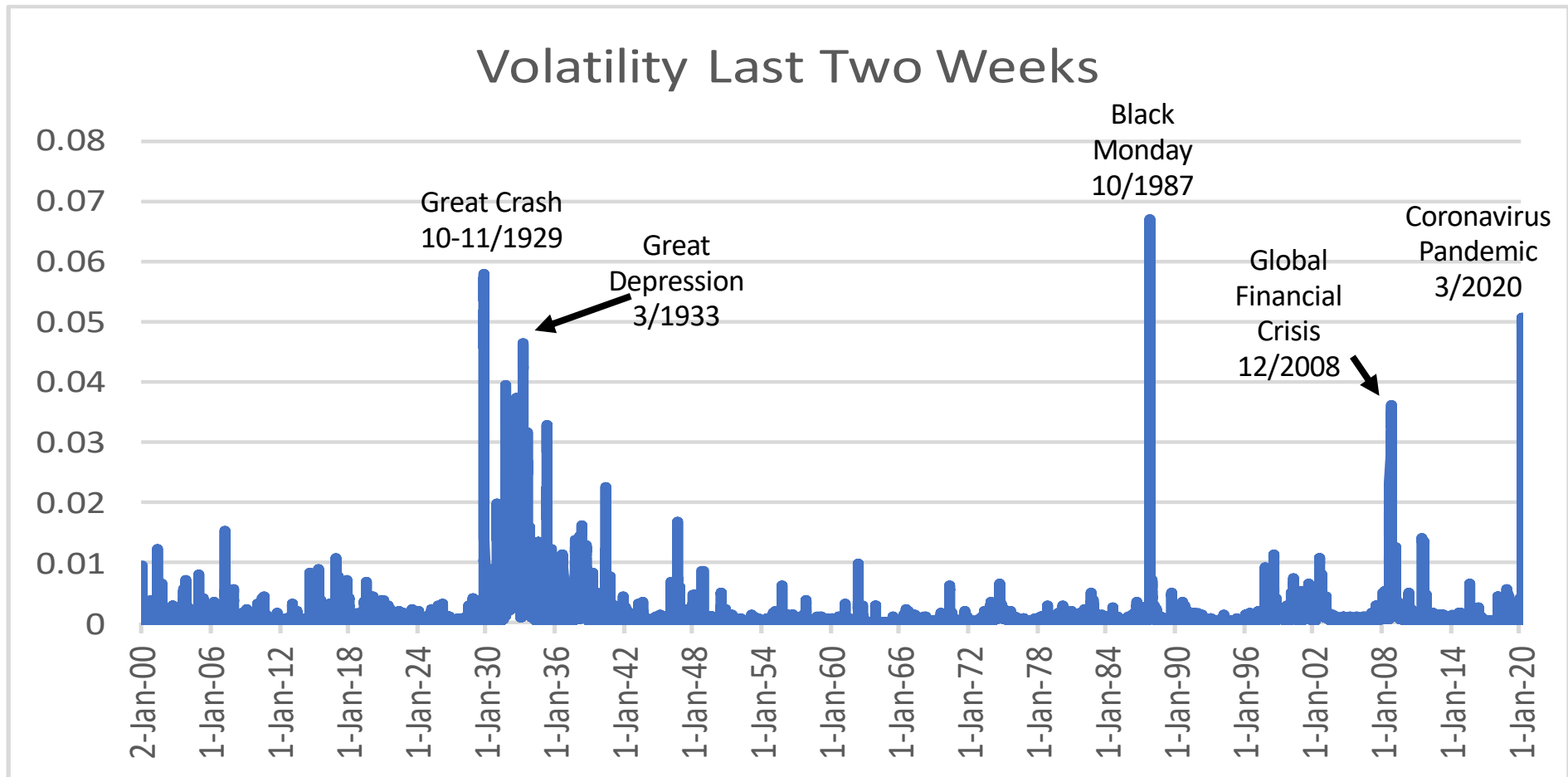
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[4] On supply chains, see Baldwin and Tomiura (2020); on cross-border commuting, see Meninno and Wolf (2020), on falling trade costs, see Jacks, Meissner and Novy (2011).

References

Baker, Scott, Nicholas Bloom and Steven J. Davis, 2016. "Measuring Economic Policy Uncertainty," *Quarterly Journal of Economics,* November.

Baker, Scott Baker, Nicholas Bloom, Steven J. Davis and Kyle Kost, 2019. "Policy News and Equity Market Volatility," NBER working paper.

Baker, Scott Baker, Nicholas Bloom, Steven J. Davis and Marco Sammon, 2018. *Coding Large Daily Financial Market Moves: Data Construction Guide.* Available at https://stockmarketjumps.com/files/coding_guide_pdf.pdf.

Baker, Scott Baker, Nicholas Bloom, Steven J. Davis and Marco Sammon, 2019. "What Triggers Stock Market Jumps?" working paper.

Baldwin, Richard, 2020. "The Supply Side Matters: Guns versus Butter, COVID-Style," *VOX CEPR Policy Portal*, 22 March.

Baldwin, Richard and Eiichi Tomiura, 2020. "Thinking Ahead about the Trade Impact of COVID-19," in *Economics in the Time of COVID-19,* edited by Richard Baldwin and Beatrice Weder di Mauro. CEPR Press.

Barro, Robert J., Jose F. Ursua and Joanna Weng, 2020. "The Coronovirus and the Great Influenza Pandemic – Lessons from the 'Spanish Flu' for the Coronavirus's Potential Effects on Mortality and Economic Activity," CESifo Working Paper No. 8166.

Cochrane, John H., 2020. "Flatten the Coronavirus Curve at a Lower Costs," *Wall Street Journal,* 25 March.

Dewatripont, Mathias, Michel Goldman, Eric Muraille and Jean-Philippe Platteau, 2020. "Rapidly Identifying Workers Who Are Immune to COVID-19 and Virus-Free Is a Priority for Restarting the Economy," *VOX CEPR Policy Portal*, 23 March.

Honigsbaum, Mark. "Regulating the 1918–19 pandemic: Flu, stoicism and the Northcliffe press." Medical history 57.2 (2013): 165-185.

Ichino, Andreas, Giacomo Calzolari, Andrea Mattozzi, Aldo Rustichini, Giulio Zanella, and Massimo Arnelli, 2020. "Transtion Steps to Stop COVID-19 without Killing the World Economy," *VOX CEPR Policy Portal*, 25 March.

Jacks, David S., Christopher M. Meissner and Dennis Novy, 2011. "Trade Booms, Trade Busts, and Trade Costs," *Journal of International Economics,* 83, no. 2 (March).

Meninno, Raffaella and Guntram Wolff, 2020. "As Coronavirus Spreads, Can the EU Afford to Close Its Borders?" in *Economics in the Time of COVID-19,* edited by Richard Baldwin and Beatrice Weder di Mauro. CEPR Press.

Monras, Joan, 2020. "Some Thoughts on COVID-19 from a Labour Mobility Perspective: From 'red-zoning' to 'green-zoning'," *VOX CEPR Policy Portal*, 25 March.

Shi, Yufang, Ying Wang, Changshun Shao et al., 2020. "COVID-19 Infection: The Perspectives on Immune responses," *Cell Death & Differ*entiation. https://doi.org/10.1038/s41418-020-0530-3.

Velde, Francois, 2020. "The Economy and Policy in the Coronavirus Crisis to Date," presentation at a panel session for the the Brookings Papers on Economics Activity, 20 March. Available at https://www.brookings.edu/blog/up-front/2020/03/20/the-economy-and-policy-in-the-coronavirus-crisis-to-date/.

Figure 1. Realized U.S. Stock Market Volatility, January 1900 to March 2020

Volatility Last Two Weeks

Great Crash 10-11/1929

Great Depression 3/1933

Black Monday 10/1987

Global Financial Crisis 12/2008
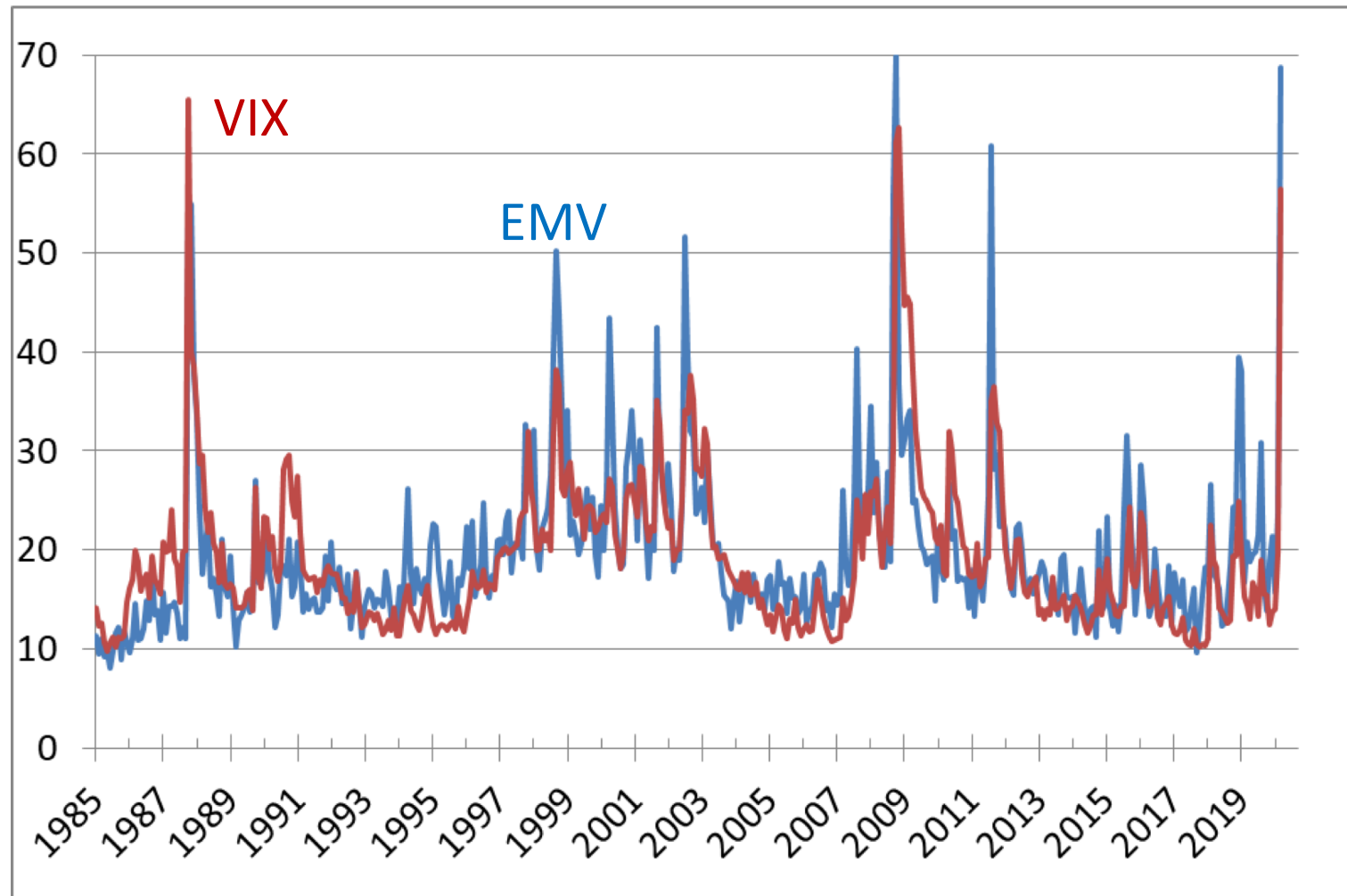
Coronavirus Pandemic 3/2020

Notes: Sample period, 1/1/1900-3/23/2020. From 12/1925-Present, returns are computed using Yahoo Finance's 'adjusted close' series for the S&P 500 (^GSPC). Before that, returns are from the Global Financial Data extension of the Dow Jones Index. Volatility last two weeks is the sum of squared returns over the past 10 trading days.

Table 1. The Unprecedented Stock Market Impact of the Coronavirus

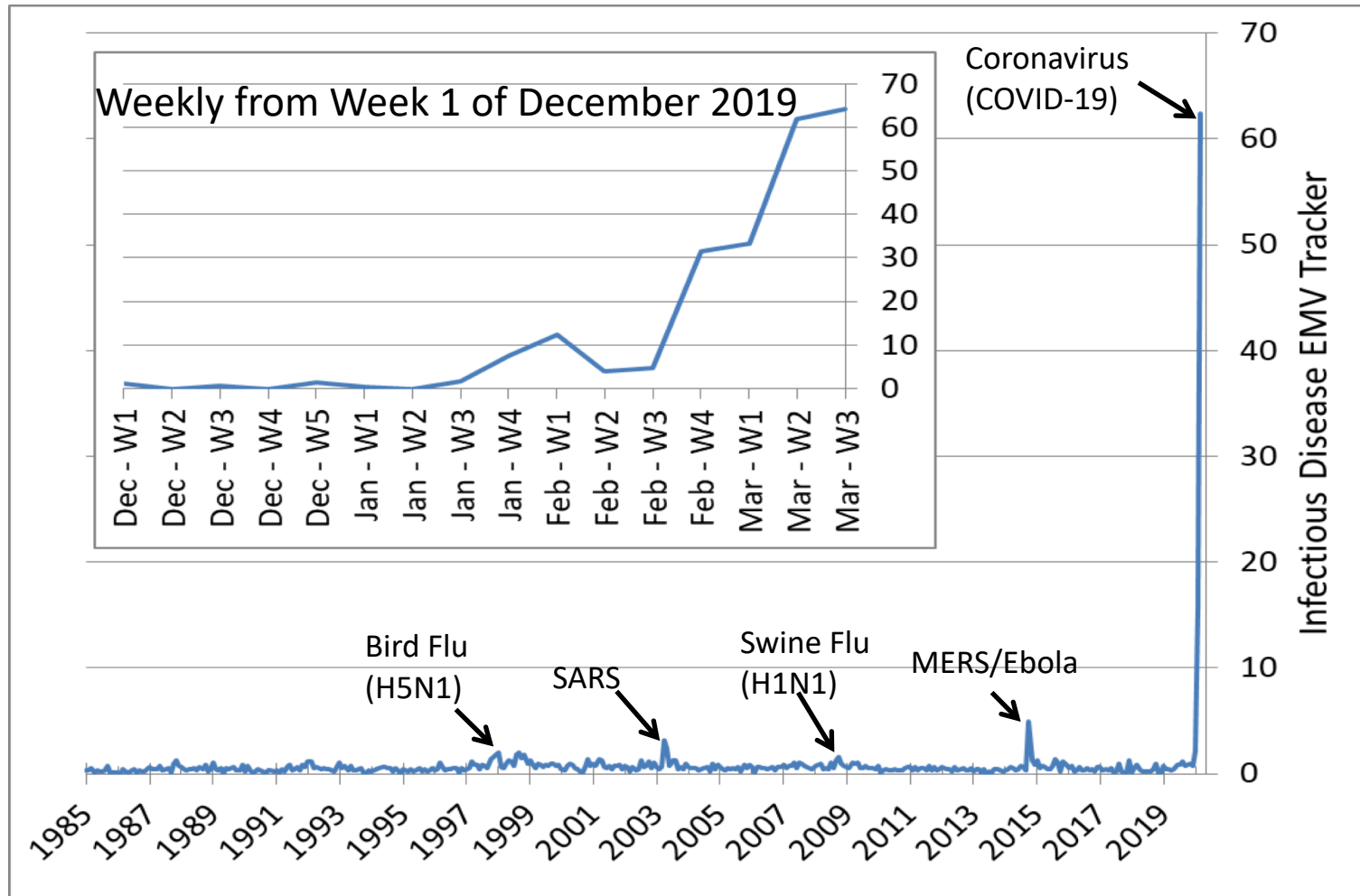|	Number of Daily U.S. Stock Market Jumps Greater than |2.5%|	Number Attributed to Economic Fallout of Pandemics	Number Attributed to Policy Responses to Pandemics
2 January 1900 to 21 February 2020	1,116	0	0
24 February 2020 to 24 March 2020	18	7.4	8

Note: Tabulated from results in Baker, Bloom, Davis and Sammon (2020), who consider all daily jumps in the U.S. stock market greater than 2.5%, up or down, since 1900. They classify the reason for each jump into 16 categories based on human readings of next-day (or same-evening) accounts in the *Wall Street Journal* (and *New York Times* in 2020). Fractional counts arise when newspapers differ in their jump attribution or human readers differ in their classification of the attribution. Number Attributed to Economic Fallout of Pandemics includes jumps on 3/12 and 3/16 that a subset of coders classified as Macroeconomic Outlook. It's clear from reading these articles that the journalist regarded the deterioration in the Macroeconomic Outlook as due to the spread of the coronavirus.

Figure 2. Newspaper-Based Equity Market Volatility Tracker and the 30-Day VIX, January 1985 to March 2020

Notes: The Equity Market Volatility Tracker reflects the frequency of articles about stock market volatility in leading U.S. newspapers, as quantified by Baker, Bloom, Davis and Kost (2019). The 30-Day VIX is constructed as the monthly average of daily closing VIX values collected from Yahoo Finance. March 2020 reflects data through March 20th.

Figure 3. Infectious Disease EMV Index, Weekly and Monthly Data from 1985 to March 2020

Notes: The Infectious Disease EMV Tracker is computed as the overall EMV tracker value multiplied by the share of EMV Articles that contain one or more of the following terms: epidemic, pandemic, virus, flu, disease, coronavirus, mers, sars, ebola., H5N1, H1N1. March 2020 data includes through March 20th.

Table 2. Stock Market Volatility in Selected Infectious Disease Episodes

	Time Period	Average Values for the Indicated Time Period		
		(1) Infectious Disease EMV Tracker Level	(2) % of EMV Articles with Infectious Disease Terms	(3) % of EPU Articles with Infectious Disease Terms
Bird Flu (H5N1)	Nov-1997 to Nov-1998	1.36	4.52	8.00
SARS	April-August 2003	1.75	8.10	9.79
Swine Flu (H1N1)	March-May 2009	0.99	3.60	4.58
Ebola & MERS	Oct-2014 to Jan-2015	2.06	10.62	12.80
Coronavirus (Covid-19)	December 2019	0.79	3.68	6.42
	January 2020	2.11	13.45	7.43
	February 2020	15.54	65.73	32.62
	March 2020	60.46	90.81	92.41
Full Period	Jan 1985-Mar 2020	0.76	3.37	5.67

Notes: The Infectious Disease term set is {epidemic, pandemic, virus, flu, disease, coronavirus, mers, sars, ebola, H5N1, H1N1}. We use the following newspapers in the analysis: Wall Street Journal, NY Times, Chicago Tribune, Washington Post, LA Times, Boston Globe, Miami Herald, USA Today, SF Chronicle, Dallas Morning News, and Houston Chronicle. We selected periods with relatively high levels of our Infectious Disease EMV tracker and labelled the time periods based on the prevalence of specific terms (e.g., SARS) in the EMV articles. Both "Ebola" and "MERS" appear in EMV articles from October 2014 to January 2015, but references to "Ebola" are much more frequent. March 2020 data includes through March 20th.