



COVID-19 Cases, Media Attention and Social Mood

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ABSTRACT

The study uses rolling regressions, both at global and country level, to analyze the impact of daily COVID-19 case numbers on four (Panic, Sentiment, Media coverage, and Fake news) indices. The indices are obtained from the Ravenpack Finance, while the daily Covid-19 cases and the policy response stringency index data is extracted from the Oxford COVID-19 Government Response Tracker. The results indicate that the impact of the number of daily COVID-19 cases on the indices is quite variable over time. Higher impact on the indices is reflected in periods where there is a significant surge in cases, in particular the initial surge in Spring, Summer and Fall. There is some evidence of diminished (increased) sensitivity of panic and media indices (fake news) to number of cases but this is not consistent across all countries. These results indicate that the public are concerned and respond to changes in the trends of the spread of the virus and highlight the importance of managing trends if halting its spread is not immediately feasible.

Keywords: COVID-19, Ravenpack Indices, Media Attention, Stringency Index

JEL Classifications: G40, G41

1. INTRODUCTION

The spread of COVID-19 pandemic has caused social and economic devastation across the globe. The International Monetary Fund (IMF, 2020) and the World Bank (2020) project a 4.4 and 5.2% contraction of the global economy in 2020, respectively. The introduction of non-pharmaceutical interventions (NPIs), such as lockdowns, to contain the spread of the virus stifled economies (Ashraf, 2020, Demirguc-Kunt et al., 2020 and Chen et al., 2020). While lockdown measures have affected the global economy, changes in social practice such as voluntary social distancing (IMF, 2020) adopted by individuals to mitigate the risk of contracting the virus has also significantly contributed to the recession. The focus of the current research relate to the later strand of research.

The idea that affects influences financial decisions is well established in the socioeconomic literature (Dreman, 2003; 2004; Nofsinger, 2005; Olson, 2006; Prechter and Parker, 2007; Saurabh and Dey, 2020). There is a strong link between sentiment and stock

market (Broadstock and Zhang, 2019; Shi and Ho, 2020; Tetlock, 2007). Agrawal et al. (2018) link investor sentiment to demand and supply of liquidity generally. Baig et al. (2020) suggest that COVID-19 cases and deaths, declining sentiment and lockdowns contribute to deterioration of liquidity. Salisu et al. (2020) show a positive relationship between commodity prices and global fear index due to its better safe-haven properties relative to stock market. Haroon and Rizvi (2020) show that panic-laden news impacted volatility particularly in sectors perceived to be more vulnerable to COVID-19.

The pandemic has generated unprecedented media attention, thereby providing an alternative channel through which COVID-19 could impact the economy. As shown by several authors (such as Tetlock, 2007; Klibanoff et al., 1998) news influx influence investor decision. Furthermore, the way the media covers, presents, or slants information in its reporting is relevant as news coverage can sway public opinion (Mutz and Soss, 1997; Mikami et al., 1995). In their study of support for the enlargement

of European Union, Claes and Boomgaarden (2006) conclude that the media matter for public opinion. Tsftai et al. (2013) show that selective exposure generated perceptions that rhymed with the outlet’s leaning. Cepoi (2020) using quantile regressions shows that fake news related to COVID-19 negatively impacts stock returns in the lower and middle quantiles, while media coverage negatively impacts middle and upper quantiles. This suggests that stock markets and COVID-19 related information exhibit asymmetric dependency.

The literature clearly links media attention, social mood and stock market. A growing number of studies (Terry et al., 2020; Zhang et al., 2020; Williams et al., 2020) confirm COVID-19 restrictions has impacted individual mood disturbance. However, currently there is little discussion in the literature on how COVID-19 has influenced media attention and social mood particularly at the aggregate level. Our study contributes to filling this gap. To this end, the objective of the present study is two-fold. First, we estimate the impact of COVID-19 cases on media coverage index and fake news index. Secondly, we assess the impact of COVID-19 cases on panic index and sentiment index. Using rolling regressions, we assess the stability of the effect of cases on these indices over time. We hypothesize that the effect of cases varied (likely diminished) over time as people acquired more information about the virus, found ways to adapt, and or people and media became desensitized over time. A growing literature has discussed the link between media attention/social mood to economy via the stock market, but the link between COVID-19 cases and media/social mood is lacking. Our research is aiming to fill this gap. We therefore help trace the channel of transmission of COVID effects that start from COVID-19 cases to media attention/social mood to the economy.

We show that for all the four indices considered, both at country and global level, the magnitude of the coefficients on the number of cases varies substantially over time, with the initial surge in Spring, Summer and Fall surge periods in particular show the most impact.

The rest of the paper is organized as follows. In Section 2, we present the data, while the methodology is explained in Section 3. In Section 4, we discuss our preliminary and main empirical results. Finally, Section 5 provides the conclusion.

2. DATA

For this study, we have merged data from two main sources. First, we obtain Ravenpack Finance Panic Index, Global Sentiment Index, Media Coverage Index and Fake News Index to measure the panic and sentiment of the investors, as well as the general media coverage and fake news about COVID-19. RavenPack Finance analytics tool accumulates real-time news from more than 19,000 global news sources such as Dow Jones Newswire, Wallstreet Journal, or StockTwits, among others (Blitz et al., 2019). This platform provides real-time media analytics, which explores announcement describing essential issues linked to the Coronavirus pandemic, such as panic, media hype, and fake news. Secondly, we obtained daily COVID-19 confirmed cases and the policy response stringency index from the Oxford COVID-19

Government Response Tracker. Table 1 provides information about the indices considered in this study. The Ravenpack indices and COVID-19 cases are available at global and country level, but the stringency index is only available at the country level.

Our worldwide indices cover the period from January 24, 2020 to November 12, 2020. The range of the dataset changes within countries depending on data availability. The list of the countries considered in this study are listed in Table 2.

Figure 1 plots the Ravenpack panic, sentiment, media coverage and fake news indices for a visual representation since the start of the year at the worldwide level. Panic and fake news indices reached the highest values in April as the virus spread globally. Sentiment index is generally negative, particularly in the early period of the pandemic up to June suggesting an overall decline in sentiment during this period. Media coverage index increased significantly up to 80 at the end of March and has stabilized at a slightly lower level thereafter. An 80 means that 80% of all sampled news providers are currently covering stories about the COVID-19.

3. METHODOLOGY

We estimate the influence of the number of COVID-19 cases and government interventions on Raven- pack indices by running the following regression, with a standard error robust to heteroscedasticity and autocorrelation:

$$Index_{i,t} = \alpha + \beta_{CC} CountryCases_{i,t} + \beta_{SI} StringencyIndex_{i,t} + \beta_{WWC} WorldwideCases_t + u_{i,t} \tag{1}$$

where $Index_{i,t}$ denotes log of one of the four different Ravenpack Indices (Panic, Sentiment, Media Coverage and Fake News

Table 1: Definition of the variables

Variable	Definition
Panic Index	It measures the level of news chatter that makes reference to panic or hysteria and coronavirus. Values range between 0 and 100. The higher the index value, the more references to panic found in the media
The Country Sentiment Index	It measures the level of sentiment across all entities mentioned in the news along- side the coronavirus. The index ranges between -100(most negative) and 100 (most positive) sentiment while 0 is neutral
The Media Coverage Index	It calculates the percentage of all news sources covering the topic of the novel coron- avirus. Values range between 0 and 100
The Fake News Index	It measures the level of media chatter about the novel virus that makes reference to misinformation or fake news alongside COVID-19. Values range between 0 and 100 where a value of 2 indicates that 2% of all news globally is talking about fake news and COVID-19
Stringency Index	It conveys information about seven different types of non-pharmaceutical interven- tions targeted to curb the outbreak of the pandemic: school closing, workplace clos- ing, cancelled public events, closed public transport, public information campaigns, restrictions on internal movement, and international travel controls

Indices) for country i on day t , $SI_{i,t}$ is the log of Stringency Index for country i on day t , $CountryCases_{i,t}$ is the log of the number of daily cases for country i on day t and $WorldwideCases_t$ is the log of the number of daily cases at the worldwide level.¹ As there is no stringency index available at the global level, worldwide level regressions consider only log of no of cases as an explanatory variable. The models are estimated with rolling regression considering window size of 45 observations to test the stability of the model parameters with respect to time and estimated coefficients are displayed over time in Figures 2-6.²

4. EMPIRICAL RESULTS AND DISCUSSION

Initial regression results covering the entire sample period (Table 3) shows that overall the number of cases significantly increase the level of panic, media coverage and the level of chatter about misinformation. Surprisingly, the coefficient on sentiment is positive suggesting that over time the sentiment improved with

Table 2: List of the Countries considered in this study

Italy	UK	Germany	Spain
China	Japan	United States	South Africa
UAE	South Korea	Australia	New Zealand

Table 3: The effects of no of daily cases on worldwide indices

	Panic Index	Sentiment Index	Media Coverage Index	Fake News Index
No of Cases	0.107***	0.233***	0.107***	0.133***
Constant	-0.135	1.009***	3.012***	-1.962
R ²	18.20%	22.21%	70.25%	20.03%

increased number of cases. This reflects the upward trend of the worldwide sentiment index over time after an initial steep drop in the earlier period of the pandemic. These results likely suffer the problem of averaging the impacts given the rapidly changing COVID-19 environment. We have also not considered the effect of containment measures implemented by governments as there is no global containment measure in these initial results. Containment measures levied a significant cost on the world economy.

¹For the countries (Italy, Germany, UK, Spain, US, India), the correlation between countries daily cases and worldwide cases are above 0.60. For that countries, we dont control with worldwide cases variable. For the rest of the 6 countries, we control for the worldwide cases.

²The results are robust to the window size of 30 or 60 observations.

Figure 2 plots the rolling coefficients. The coefficients vary widely, ranging from positive to negative. Clearly the impact of COVID-19 cases is not stable. For the panic index, the coefficients are the most positive during the early surge of cases around March. This indicates that an increase in number of cases raised the level of global panic substantially around this period. After this the coefficients are generally negative. The coefficients are briefly positive (though smaller in magnitude compared to March) during the second (Summer) surge and the third (Fall) surge. These results suggest that the early spread of the virus had large impacts on the global panic levels. But later as people adapted, the effect on the panic index is smaller or even negative. It takes a substantial rapid increase in cases to raise the panic level.

A similar trend is seen with the sentiment index. Around March increase in cases depressed sentiment as the coefficients are

Figure 1: Ravenpack Media Indices values over the year

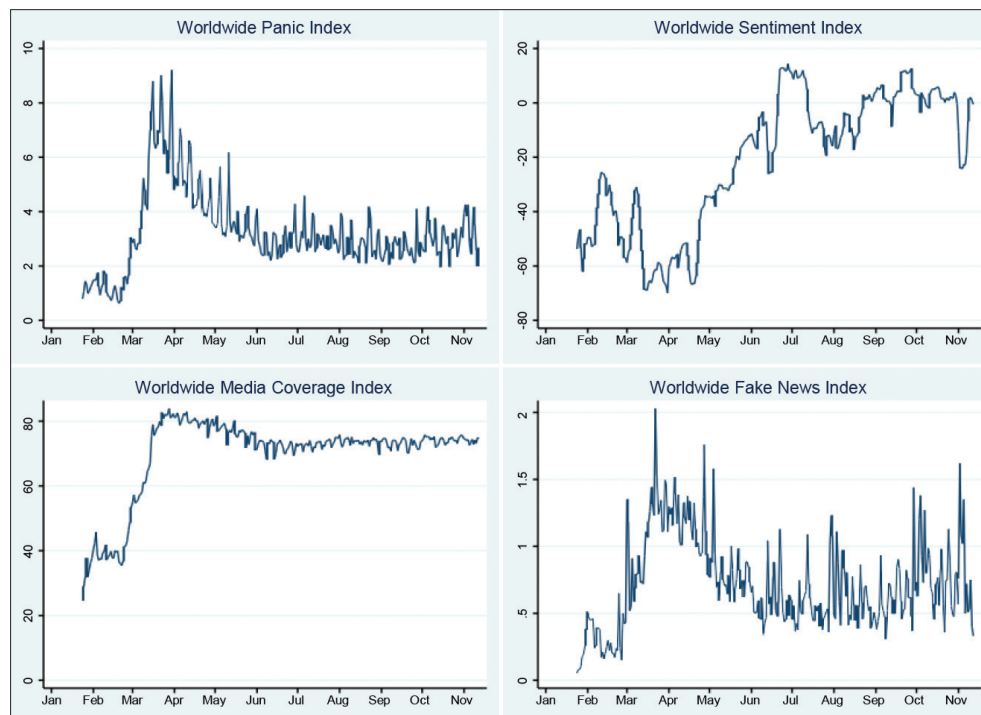


Figure 2: Worldwide media indices are regressed against number of worldwide cases with a rolling window length of 45 days. Blue lines represent the rolling coefficient of number of cases and red dots represent the days that coefficients are significant

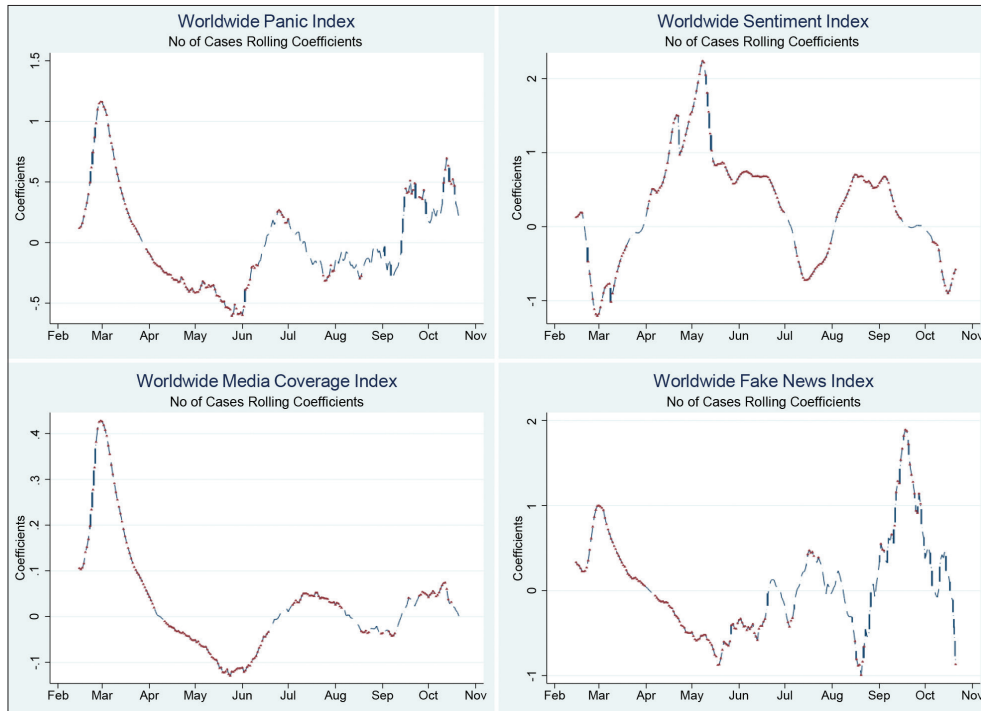
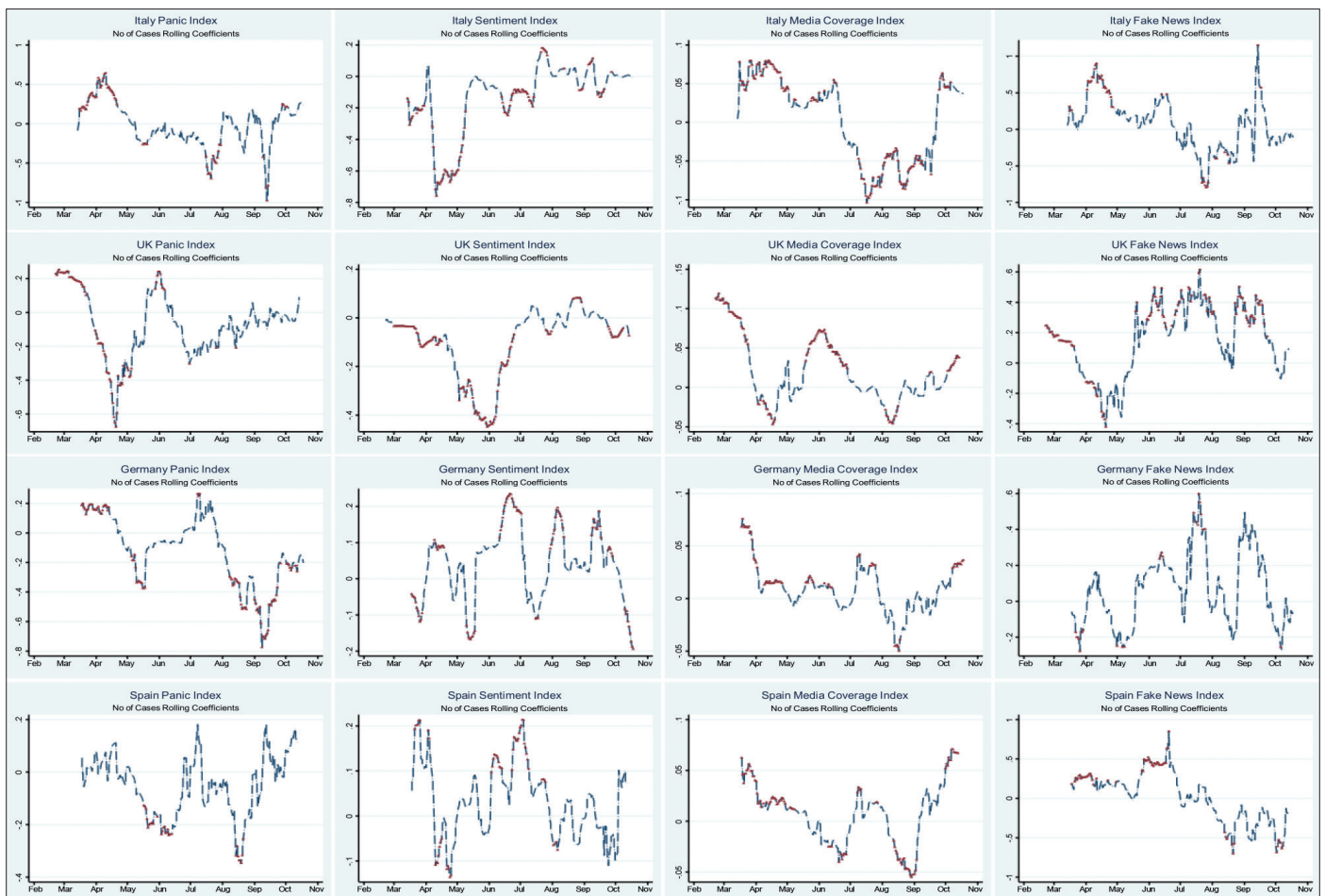


Figure 3: Country indices are regressed against number of daily cases and stringency index with a rolling window length of 45 days. Worldwide Cases variable is not considered due to high correlation between country daily cases and worldwide daily cases. Blue lines represent the rolling coefficient of number of cases and red dots represent the days that coefficients are significant



negative. The Summer and Fall surges also produce negative effects on sentiment. For media coverage, the coefficients are mainly positive. But the magnitude is much larger during the early part of the pandemic (in March). Early increases in cases raise the fake news index. But interestingly, unlike the other indices, the impact of cases on fake news index is the highest in Fall. From these results, it seems the impact on panic, sentiment and media coverage diminishes over time, but the sensitivity of fake news to cases seems to increase.

We next turn to country level effects. These regressions (Figures 3-5) control for the intensity of containment measures using the country level stringency index as well as global cases for some countries.³ Generally, the country graphs show that the impact of cases on the panic index is positive during the early spread of Covid 19 in the country (around March/April/May depending on the country). This indicates higher COVID-19 cases increased the panic level at the start of the pandemic in the country. Also to some extent, we see in most cases positive coefficient around.

³For countries (Italy, UK, Germany, Spain and USA) daily country case numbers are highly correlated with global daily

case numbers. For these countries, global daily case numbers are not considered.

July/August (Summer surge) and particularly around October (Fall surge). Clearly, the coefficient on COVID-19 cases is variable. Interestingly even countries that had managed to bring down cases to a level considered manageable such as China and New Zealand still show strong positive coefficients in September/October. The effect of cases on the sentiment index reflects a similar trend. Early growth in COVID-19 cases as well as the Summer and/or Fall surges depress the sentiment index. While there is an indication that the magnitude of the coefficient diminishes over time for some countries (Italy, UK), this does not seem consistent across all countries.

Turning to media coverage, we see that the impact of COVID-19 cases is variable too. As expected the coefficients generally are positive mainly around the first surge of COVID-19 cases in the countries. In addition, the coefficients also peak around September/October. Lastly, we look at the effect of COVID-19 cases on fake news index. The coefficients on cases are generally positive, particularly during the early

Figure 4: Country indices are regressed against number of daily cases and stringency index with a rolling window length of 45 days. Worldwide Cases variable is not considered for US Due to high correlation between country daily cases and worldwide daily cases. Blue lines represent the rolling coefficient of number of cases and red dots represent the days that coefficients are significant

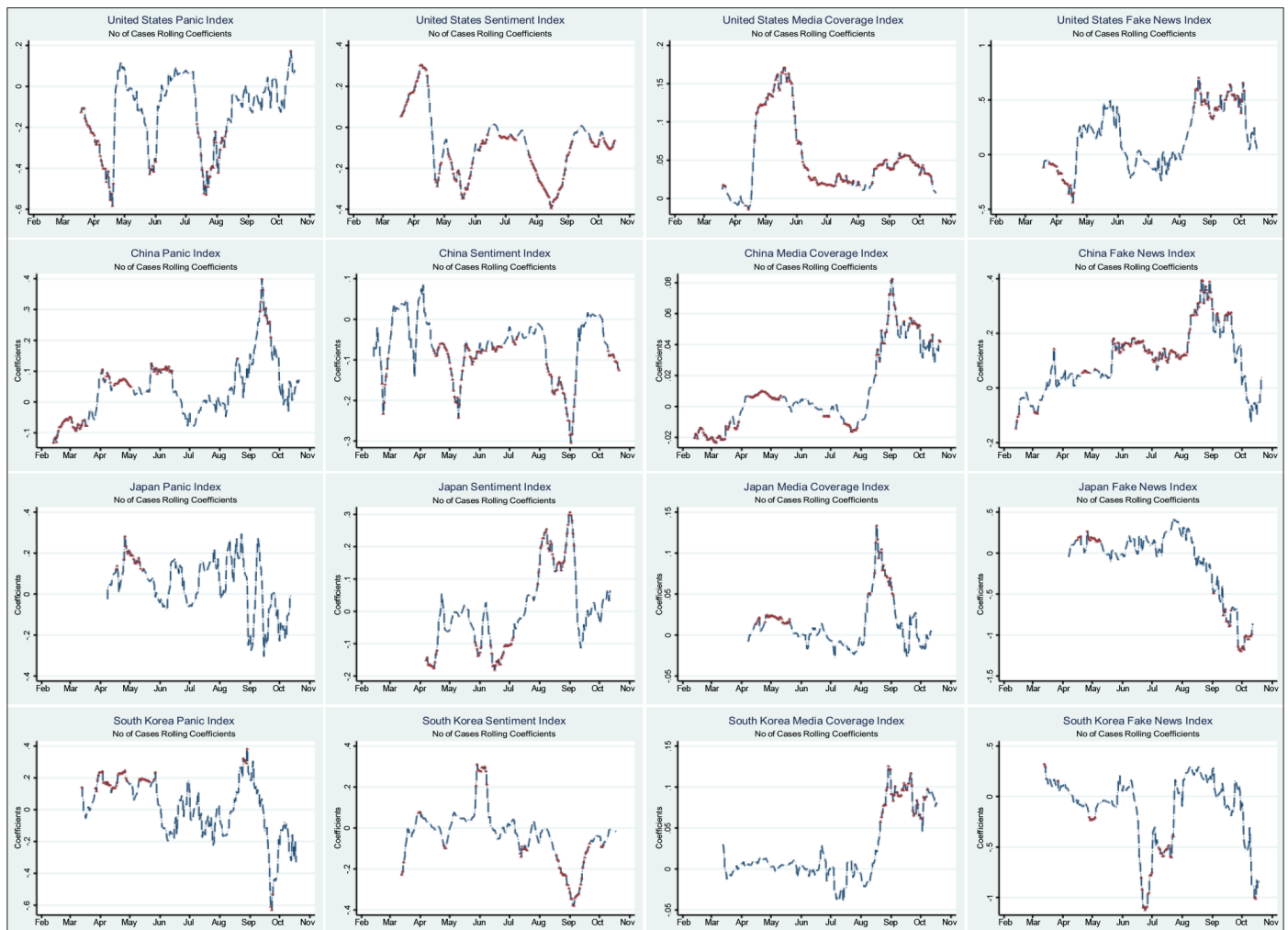
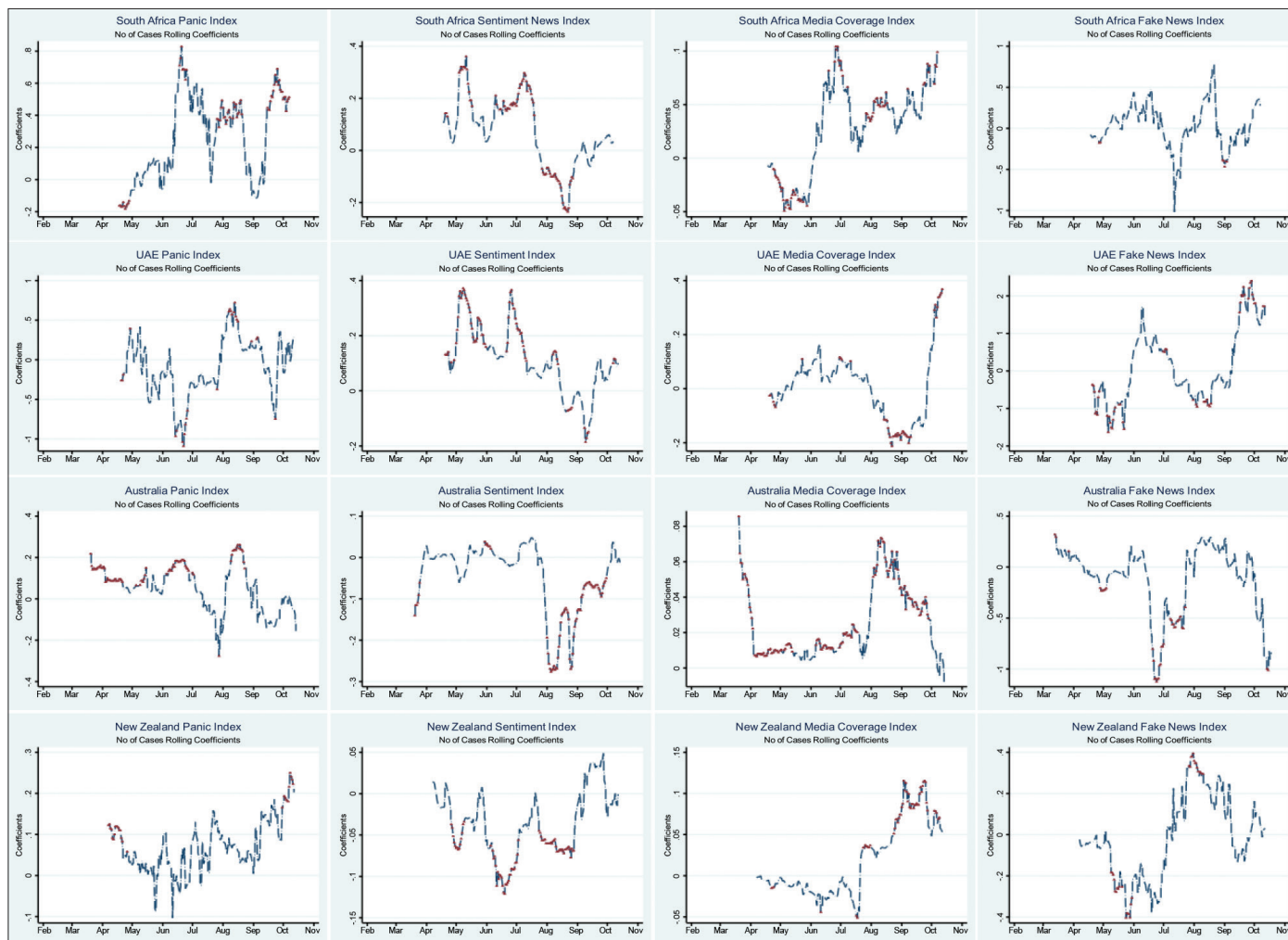


Figure 5: Country indices are regressed against country number of daily cases, worldwide daily cases and stringency index with a rolling window length of 45 days. Blue lines represent the rolling coefficient of number of cases and red dots represent the days that coefficients are significant



surge and Fall surge indicating increasing COVID-19 cases promoted references to misinformation or fake news. We also note that the coefficients generally seem to be larger in magnitude during the Fall surge (September/October) suggesting that as the pandemic progressed it generated more references to fake news. The results for Japan and South Korea however are markedly different. The coefficients are mostly negative and when positive are relatively small.

5. CONCLUSION

We use rolling regressions to analyze the impact of daily Covid-19 case load on four (Panic, Sentiment, Media coverage, and Fake news indices) indices. The analysis explores the impact of Covid-19 cases both at the global level and at country level. Simple linear regressions over the full sample period suggest that Covid-19 cases significantly increase the level of panic, media coverage and the level of chatter about misinformation, and surprisingly improve sentiment. However, from the rolling regressions we show that for all the four indices, at country and global level, the magnitude of the coefficients on the number of cases varies substantially over time. It is clear that the impact of the number of daily Covid-19 cases on the indices is not stable. This

supports our preference for a more dynamic analysis to capture the rapidly changing Covid environment.

The spread of the virus during the early stages had large impacts on the indices, as well as during significant surge periods. Generally, the global and country coefficients (graphed) show that the impact of cases on the panic index is positive during the early spread of Covid 19 in the country (around March/April/May depending on the country), around July/August (Summer surge) and around October (Fall surge). Similar patterns are observed for media coverage and fake news indices. Cases, however, depress sentiment around March/April, as well as during the Summer and Fall surges. These results indicate that the daily volume of cases is less important compared to the direction and rate of change in cases.

At global level, an increase in daily cases show the most impact (largest positive coefficient for panic and media coverage and largest negative for sentiment) during the early surge in Spring and less during the Summer and Fall. This diminished effect does not seem to be consistently reflected at the country analysis however. The sensitivity of fake news to cases seems to increase with the magnitude of coefficient

peaking during the Fall surge at global level and at country level with some notable exceptions (such as Spain, Japan and South Korea).

The results have important implications for policy. First, while it is considerably harder to halt the spread of a virus, policies to manage trends in case numbers during a pandemic are more achievable and, from these results, beneficial in managing social mood. In addition, efforts to manage the spread of the virus should include programs to ensure availability of quality and trusted information as well as to counter misinformation. A limitation of the current work is the relatively small number of countries covered in the study. Future research could extend country coverage as well as consider how Covid-19 cases/deaths and press freedom combine to influence media coverage and fake news indices.

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