



Short Communication

Is the COVID-19 vaccine effective on the US financial market?

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ARTICLE INFO

Article history:

Received 14 June 2021

Received in revised form

19 July 2021

Accepted 22 July 2021

Available online 29 July 2021

Keywords:

COVID-19

Vaccination

Case fatality ratio

Infection rate

Wavelet coherence

ABSTRACT

Objectives: COVID-19 is the most devastating pandemic that affected humanity and the world economy. This paper aimed to study the time-varying connectedness between the COVID-19 vaccination, infection rate (INFR), and the case fatality ratio (CFR) in the United States and the stock market returns.

Study design: We used COVID-19 daily confirmed number of infections, deaths, and vaccinations and the daily US stock market index return.

Methods: A wavelet coherence approach was used to assess the co-movement of the US stock market with the COVID-19 vaccination, INFR, and the CFR.

Results: The COVID-19 vaccination, INFR, and CFR have a positive and significant influence on S&P 500 returns at the majority of business cycle frequencies with an in-phase relation.

Conclusions: The wavelet coherence analysis uncovers strong and significant connectedness between COVID-19 vaccination rate and S&P 500 return. From an economic perspective, the US government should continue its intervention with their vaccination strategy, as it is beneficial for fighting the pandemic. This may lead to the recovery of the stock market as well as to the whole economy.

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Introduction

The global COVID-19 pandemic that began in early 2020 has had a tragic impact on humanity and devastating effects on the whole economy and financial markets. As such, a growing body of literature has focused on the impact of the COVID pandemic on the financial markets.¹ Notably, many of these studies have investigated the impact that COVID-19-related infections and deaths have had on stock market performance.² They have shown that stock markets were significantly and negatively affected by the COVID-19 pandemic.³ Furthermore, it has been showed that the stock market response was more sensitive to the growth in the number of COVID-19-related infections than to the number of deaths.⁴

Healthcare systems worldwide remain stressed because of the continuous rise of COVID-19 cases. In this context, it has reported that the health sector is the source of sectorial contagion during the COVID-19 outbreak.⁵ Recently, in the equity markets, most global indices have resumed an upward movement, accompanying the gradual reopening of businesses in the United States and reversing

the downward trend at the end of February 2021. The implementation and acceleration of the vaccination program in December 2020 contributed to slowing the health crisis in the United States. Moreover, it also slowed economic turmoil by increasing consumer confidence. In fact, optimism about health outcomes fuels hopes of a rebound in the American financial market.

Our study is related to the literature on the effect of the resolution of a health crisis on stock price dynamics. Our main contribution consists of showing the co-movements between COVID-19 vaccination rate and the US stock market recovery. To the best of our knowledge, this is the first paper to examine the COVID-19 vaccination-stock price nexus. Our findings reveal that stock market dynamics are closely linked to investor sentiment and confidence in strategies to address the health crisis. Furthermore, we demonstrated a high time-frequency dynamic co-movement between S&P 500 returns and COVID-19 variables. Interestingly, the COVID-19 vaccination strongly causes S&P 500 returns at all business cycle frequencies and under normal market conditions.

Data

In our study, we considered daily closing S&P 500 prices obtained from FactSet. We also used three data sets corresponding to

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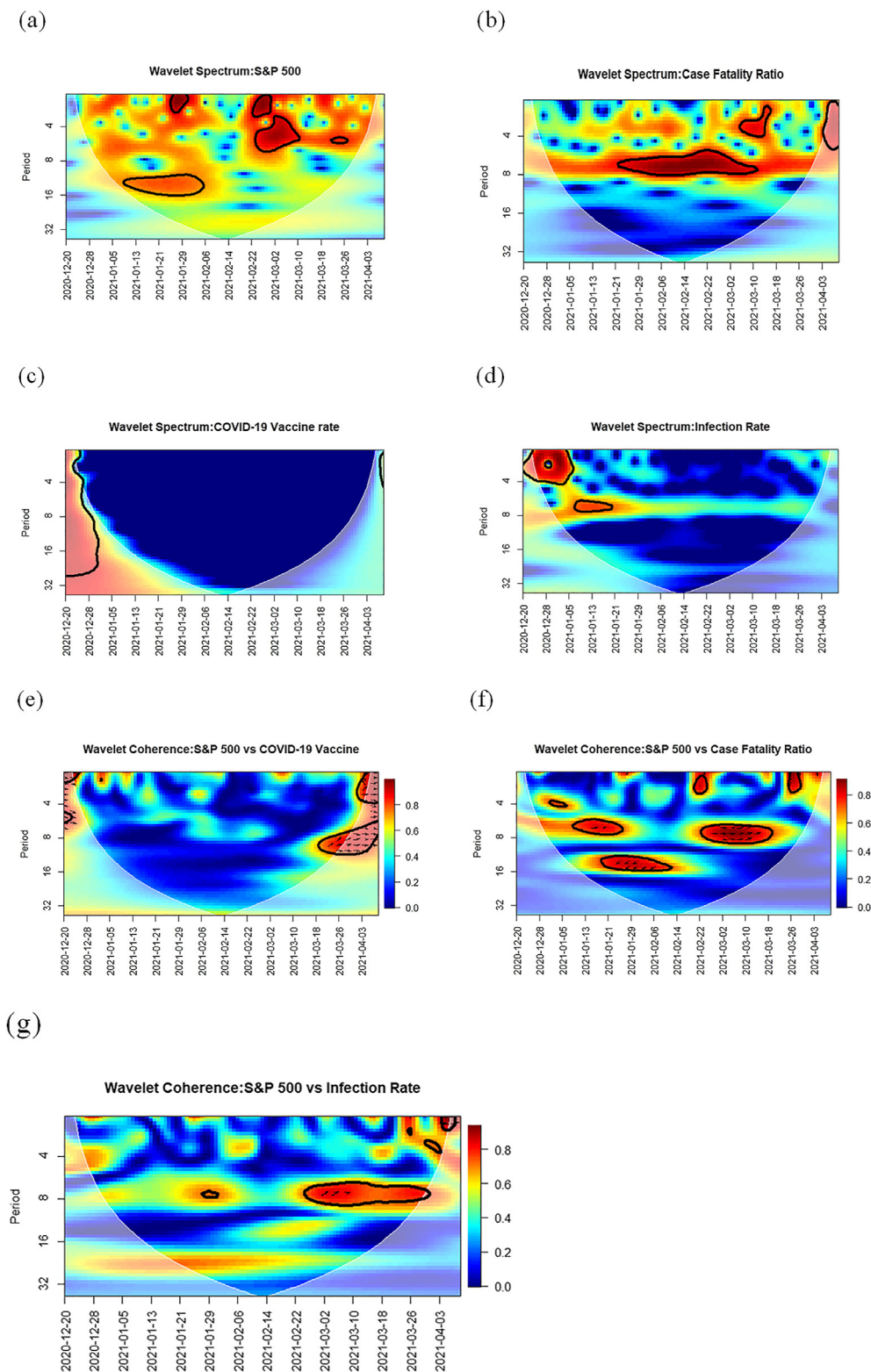


Fig. 1. Summary results of wavelet analysis. (a–d) The wavelet power spectrum. The thick black contour indicates the significance level, whereas the cone of influence is denoted with the thin curved white line. The color code spans from blue (low intensity) to red (high intensity). (e–g) The wavelet coherence. The significance level is shown by the thick black contour, whereas the cone of influence is denoted with the thin curved white line. The color bar shows the strength of the coherence between variables. The strength spans between blue (0; low coherence) and red (1; high coherence). Arrows in the coherence map indicate the lead-lag relationship, with left-tailed (\rightarrow) and right-tailed (\leftarrow) arrows denoting in- and anti-phase relationships, respectively. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

COVID-19 pandemic, namely, the number of daily confirmed infections, the number of daily deaths, and the number of daily COVID-19 vaccinations, which was obtained from the ourworldindata.org. The sample period covers December 20, 2020, to April 9, 2021. S&P 500 returns are calculated as $r_t = \log(\frac{p_t}{p_{t-1}})$. We constructed the following measures:

$$\text{Infection rate(INFR)} = \frac{\text{Number of daily confirmed infections}}{\text{Populationsize}}$$

$$\text{Vaccination rate(VACCR)} = \frac{\text{Number of daily COVID19 vaccinations}}{\text{Population size}}$$

We developed a measure on the impact of US mortality,⁶ namely, the case fatality ratio (CFR).

$$\text{Case Fatality Ratio(CFR)} = \frac{\text{Number of daily deats}}{\text{Number of daily confirmed infections}}$$

To investigate the dependencies in time and frequency for each pair of variables, we used the wavelet coherence (WC).⁷

Key findings

Looking at first at the Wavelet Power Spectrum (WPS), the scalogram of each time series, which reflects the power of the variance of each variable in time-frequency domain, is portrayed in Fig. 1. As per Fig. 1(a)–(c), the S&P 500 returns and CFR are more volatile than the other ratios as indicated by the dominance of the hot color. The INFR exhibits high levels of volatility at the beginning of the study period and at 4–8 frequency cycles or less. At 8-day frequency (i.e. a 1-week business cycle), the INFR shows high volatility during the entire period. The lowest volatile series is the COVID-19 vaccination rate. Using WPS, we were unable to discern the connection between the variables and any cause-effects of the COVID-19 vaccination, INFR, and CFR on S&P 500 returns.

An assessment of the time-frequency dynamics of the co-movement and lead-lag relationship between S&P 500 return and other variables is presented in the subsequent step of the wavelet analysis. The coherence maps for the pairs, S&P 500-VACCR, S&P 500-INFR, and S&P 500-CFR are displayed in heatmap in Fig. 1. The timeline and period are presented on the horizontal and vertical axis, respectively. High coherence between the variables is shown in red, whereas low coherence is reflected in blue. The WC map for S&P 500 versus COVID-19 vaccination reveals that there is no dependence between this pair from the beginning of the study period (December 20, 2020) until the end of February 2021. Importantly, however, the S&P 500-VACCR pairing shows that the S&P 500 and COVID-19 vaccination are highly coherent with in-phase relation from the beginning of March 2021 until the end of the study period (April 9, 2021), as indicated by the significant red-colored pockets and left-tailed arrows. This finding implies that the COVID-19 vaccination strongly and positively affects S&P 500 returns at all data interval, which is useful information for various investors and market actors.

The heatmap of S&P 500-CFR pair in Fig. 1E–G shows many hot-colored (red, orange, and yellow) “islands,” suggesting a significant strong coherence between S&P 500 return and CFR. For instance, in the second half of January 2021, and for the cycles with periodicities

of 12–16 days, the S&P 500 return is highly dependent on CFR with S&P 500 leading. The coherence between the S&P 500 and INFR shows strong causal interplay during the entire period, as shown by the dominance of red-, orange-, and yellow-colored islands. There is a strong significant connection at around 8-day business cycle frequency, particularly from February 22, 2021, to March 30, 2021, coincident with a lagging COVID-19 infection rate (INFR).

In summary, the COVID-19 vaccination, INFR, and CFR have a strong and significant and positive influence on S&P 500 returns at the majority of business cycle frequencies with an in-phase relation. From an economic perspective, the US government should continue its intervention with vaccinating the American people, as it is beneficial for investing in S&P 500 stock.

Conclusion

This article aims to study the time-varying connectedness between the COVID-19 vaccination, INFR, and the CFR in the United States and the S&P 500 stock market returns. The findings of WC analysis uncover strong and significant connectedness between S&P 500 return and COVID-19 vaccination rate, INFR, and the CFR. Indeed, our findings are constructive for policymakers to determine the vaccination policy and its impact on the financial markets and the economy. There are some limitations in this research: this study was performed at the level of one nation; in the future, it would be worthwhile to examine data at the worldwide level rather than at the national level if the vaccination data are available and reliable.

Author statements

Ethical approval

Not required.

Funding

This work has not received any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing interests

None declared.

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