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The impact of government interventions on cross-listed securities: Evidence from the COVID-19 pandemic

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ABSTRACT

This paper examines the impact of COVID-19 related governments’ interventions on the volatility and liquidity of American depository receipts (ADRs). Using a wide dataset of 387 ADRs from 34 countries around the globe, we provide an examination of the effect of economic and non-economic interventions on the quality of these cross-listed securities. Our results suggest that closures, restrictions, as well as containment health steps implemented during the outbreak period of the pandemic, seem to deteriorate the ADRs’ liquidity and stability. The negative impact holds for different control variables and regression specifications and is not subsumed by the inclusion of the daily confirmed cases as a proxy for the severity of the pandemic. The information documented here may assist financial market participants in their risk management. The findings could also be important for policymakers for their preparedness plans in case of future crises.

1. Introduction

There is a rapidly growing stream of literature examining the impact of the COVID-19 pandemic on financial markets. Since the outbreak of the pandemic in early 2020, sizeable efforts have been devoted to exploring the influence of the pandemic on a variety of assets classes, \textit{inter alia}, the equity markets (Corbet et al., 2020; Engelhardt et al., 2021, Zaremba et al., 2021a), the debt markets (Zaremba et al., 2021b, A. 2021c), commodities (e.g., Lin and Su, 2021; Sifat et al., 2021) and cryptocurrencies (e.g., Sarkodie et al., 2021; Wasiuzzaman and Rahman, 2021). As the pandemic deepened, governments implemented various health-related programs, economic support plans, and social restrictions in an attempt to ease the adverse impacts of the COVID-19 spread. Subsequently, an evolving strand in the financial literature examines the potential impact of these interventions on key variables such as the returns, volatility, and liquidity in equity markets (e.g., Albulescu, 2021; Baig et al., 2021d; Harjoto et al., 2020; Zaremba et al., 2021d).

Existing cross-country analyses predominantly employ an aggregate approach by utilizing country-level market indices as their main focus of study. Thus, the firm-level effects of COVID-related government intervention across countries remains largely unexplored. This study aims to start filling this void in the literature by examining American Depositary Receipts (ADRs). While ADRs are traded in the US, the underlying stocks in our sample come from 34 countries around the globe. ADRs offer several advantages over market indices, the first of which is the advantage of a \textit{firm-level} cross-country investigation. The use of ADRs provides a unique design

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that controls for different market structures, currencies, and other country effects. It allows us to exploit the cross-sectional variation in government interventions across countries, in addition to the time-series variation used by prior studies as the main methodology. Prior studies also demonstrate that using ADRs alleviates several endogeneity issues (Blau et al., 2014; Baig et al., 2019; Baig et al., 2021c). Lastly, but no less importantly, the use of ADRs listed in US markets mitigates a potential non-synchronous trading bias that may arise in exploring international capital markets, or liquidity issues, which are a common feature in emerging markets.

There are several potential channels through which government interventions can influence ADRs’ performance. According to the supply of stock returns hypothesis (Diermier et al., 1984; Harjoto et al., 2020; Ibbotson and Chen, 2003), the performance of the domestic capital market reflects economic activity. Therefore, any disruption to sustainable business activity might affect the real economy, and consequently, will be translated to a response by investors. The outcome of these disruptions can be related to an increased uncertainty originating from government interventions. According to the theoretical model by Pastor and Veronesi (2012), government interventions change the perception of the economic status quo and might induce two types of uncertainties. The first type of uncertainty concerns the future consequences of the type of intervention imposed. The second is ambiguity concerning future policy, i.e., whether similar actions are expected to encounter in the future. As capital markets are overwhelmed with uncertainty during COVID-19 (Baker et al., 2020), the implementation of interventions may even worsen investors’ ambiguity about the real consequences for the economy and consequently trigger undesirable effects on volatility and liquidity. This suggests closures, quarantines, mobility restrictions, and any type of government intervention that poses uncertainty for sustaining economic activity, will potentially be reflected in increased volatility and poorer liquidity levels. Using data from University of Oxford’s COVID-19 Government Response Tracker, we test this hypothesis by examining the impact of various government interventions on the volatility and liquidity of ADRs.

The main results of our study are as follows. First, after controlling for the specific characteristics of ADRs as well as country and industry fixed effects, restrictions such as stay-at-home requirements and workplace closings are related to higher volatility and lower liquidity in ADRs. A one percentage increase in the stringency index is associated with at least a 0.082 (0.144) percentage increase in ADRs’ bid-ask spread (volatility). Secondly, this relation also holds for all types of indices reflecting different types and expressions of intervention intensity, such as economic, health, containment, and general response indices. We find that the spread and volatility of emerging market ADRs are most sensitive to the economic type of government interventions. Lastly, the adverse impacts of government intervention intensity, such as economic, health, containment, and general response indices, are significantly higher in emerging markets compared to developed markets. We note that although most of the ADRs in our sample are from China, our results are not driven by Chinese ADRs. In unreported tests, we show that excluding Chinese ADRs there is still an adverse impact of interventions on ADRs volatility and liquidity.

2. Data description

We retrieve the required data from various sources. First, closures, economic, health, and general interventions indices, as well as country-level COVID case data, are retrieved from the Oxford database. Specifically, we extract the Stringency_Index, Economic_Index, Containment_and_Health_Index, and Government_Response_Index. Table 1 details the information about each Index. Second, we obtain the daily ADR price- and volume-related information from the Center for Research in Security Prices (CRSP). For each ADR we manually identify the corresponding home country from Bloomberg. Finally, we use the International Monetary Fund (IMF) definition for emerging markets.

We use the raw data to construct the following variables:

- Range_Volatility: the daily ADR volatility calculated as the difference between the natural log of intra-day high and low prices.
- Spread: the daily bid-ask spread computed as the difference between ask and bid prices of ADRs scaled by the mid-point.
- Amihud_M: the daily Amihud (2002) price impact measure computed by scaling the absolute return by the dollar volume scaled up by one million.
- Size: the daily market capitalization computed as the product of price and shares outstanding.
- Turnover: calculated as the daily trading volume scaled by the number of shares outstanding.
- Cases (Deaths): the daily number of COVID-19 infected cases (fatalities) in the respective country.

Our final dataset is an ADR-day panel consisting of 387 ADRs from 34 countries and spans from October 1st, 2019, to March 30th, 2020. This provides us with six months surrounding the arguably first confirmed COVID-19 case. The three months pre-COVID-19 window provides us a control sample to draw efficient comparisons and inferences vis-à-vis the COVID-19 period.

Table 1 summarizes the statistical properties of variables of interest. About 41% of our sample is listed on NASDAQ, and 59% listed on the NYSE or AMEX exchanges. Additionally, almost 57% of the ADRs’ underlying stocks are from emerging markets. Additionally, Appendix A2 presents detailed summary statistics by country. China provides the most ADRs in the sample and has the most stringent government response and containment actions, while Hong Kong has the most intensive economic interventions.

1. https://www.big.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker.
2. Appendix A1 provides the Pearson correlations matrix.
3. We note that although most of the ADRs in our sample are from China, our results are not driven by Chinese ADRs. In unreported tests, we show that excluding Chinese ADRs there is still an adverse impact of interventions on ADRs volatility and liquidity.
3. Methodology and empirical results

To ensure the robustness of the regression models, we utilize a series of univariate and multivariate regressions. We employ several variations of specifications and combinations of control variables, industry fixed effects, country fixed effects, and robust standard errors clustered at the ADR-level.

In our first set of tests, we investigate the relation between the government intervention indexes and the bid-ask spread using variations of the following regression specification:

$$\ln(\text{Spread}_i) = \beta_0 + \beta_1(\ln(INV)_i) + \beta_2(EM \times \ln(INV)_i) + \beta_3(EM)_i + \beta_4(\ln(Cases)_i) + \beta_5(\ln\text{Price}_i) + \beta_6(\ln\text{Size}_i) + \beta_7(\text{Turnover}_i) + \epsilon_i$$

(1)

Table 2 presents the results for our main independent variable of interest, LN_INV, the natural log of a certain intervention index. The left, middle, and right sides of the table report the results obtained for the Stringency, Economic, and Health indexes, respectively. The adverse relation of all types of interventions is clear, as our estimations imply that all types of interventions are associated with increased ADRs spread. The findings are robust under alternative models. Hence, for brevity, we discuss the results for models [3] and [5] for each index.

In model [3], we include industry and country fixed effects along with the controls variables. In model [5] we include industry fixed effects and the controls excluding country fixed effects as we include a dummy variable for emerging markets and its interaction with the respective intervention index. Model [3] yields a positive coefficient (0.041%, p-value<0.01) on the natural log of stringency

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4 The industry fixed effects are based on Fama and French 48 industry classifications.
5 We also investigate the impact of governments’ interventions on other liquidity aspects such as price impact. We repeated our examinations of model (1) without Amihud (2002) illiquidity measure as a control and our results are virtually unchanged. We also use Amihud (2002) as our dependent variable and draw similar inferences.
6 Additional results for the Government Response Index are included in Appendix A3.
7 We note that Turnover is a dimension of liquidity. However, we control for turnover in our regressions because recent literature suggests that stock trading activity and intensity increased during the pandemic (Baig et al., 2021b; Chiah and Zhong, 2020; Ozik et al., 2021) while liquidity decreased (Baig et al., 2021a; Eaton et al., 2021). We therefore ensure that we control for this aspect while drawing inferences on the bid-ask spreads.

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Table 1
Summary Statistics.

|                      | Mean [1] | Median [2] | Standard Deviation [3] | 25th Percentile [4] | 75th Percentile [5] |
|----------------------|----------|------------|------------------------|---------------------|---------------------|
| Stringency_Index     | 17.11    | 0.00       | 29.23                  | 0.00                | 19.44               |
| Economic Support_Index| 2.95     | 0.00       | 14.10                  | 0.00                | 0.00                |
| Government_Response_Index | 14.37   | 0.00       | 23.15                  | 0.00                | 16.15               |
| Containment_Health_Index | 15.99   | 0.00       | 25.76                  | 0.00                | 18.45               |
| Range_Volatility     | 0.05     | 0.03       | 0.05                   | 0.02                | 0.06                |
| Spread               | 0.01     | 0.00       | 0.02                   | 0.00                | 0.01                |
| Amihud_M             | 0.58     | 0.00       | 2.46                   | 0.00                | 0.08                |
| Size                 | 3.10     | 0.32       | 13.16                  | 0.05                | 1.70                |
| Price                | 22.39    | 9.64       | 35.04                  | 4.08                | 25.02               |
| Turnover             | 0.03     | 0.01       | 0.34                   | 0.00                | 0.02                |
| Δ&S&P500             | 0.00     | 0.00       | 0.03                   | 0.00                | 0.00                |
| Emerging_Market (EM) | 0.57     | 1.00       | 0.50                   | 0.00                | 1.00                |
| Nasdaq               | 0.41     | 0.00       | 0.49                   | 0.00                | 1.00                |
| Confirmed_Cases (Cases) | 8715.52 | 0.00       | 23,419.58              | 0.00                | 23.00               |
| Confirmed_Deaths (Deaths) | 306.61 | 0.00       | 878.49                 | 0.00                | 0.00                |

We obtain the four stringency and policy indexes namely the Stringency Index, the Economic Support Index, the Government Response Index, and the Containment Health Index from the Oxford COVID-19 Government response tracker. Stringency Index represents the strictness of ‘lockdown style’ policies. Economic Support Index captures government measures including income support and debt relief programs. Government Response Index reflects an overall government response. The Containment Health Index captures ‘lockdown style’ policies. Economic Support Index captures government measures including income support and debt relief programs. Government Response Index reflects an overall government response. The Containment Health Index captures ‘lockdown style’ policies.
Table 2
Interventions Indexes and Liquidity Regressions.

| Model               | STRINGENCY Ln_Spread | ECONOMIC Ln_Spread | HEALTH Ln_Spread |
|---------------------|-----------------------|-------------------|-----------------|
|                     | [1]                   | [2]               | [3]             | [4]           | [5]                   | [1]       | [2]       | [3]       | [4]           | [5]                   | [1]       | [2]       | [3]       | [4]           | [5]       |
| Ln(INV)             | 0.100***              | 0.066***          | 0.041***        | 0.055***       | 0.033***       | 0.117***          | 0.136***  | 0.085***  | 0.093***  | 0.082***       | 0.096***          | 0.062***  | 0.040***  | 0.053***  | 0.028**       |
|                     | (7.873)               | (10.302)          | (6.123)         | (1.991)        | (5.193)        | (16.294)          | (11.538)  | (6.954)   | (6.766)   | (7.213)        | (7.211)           | (9.518)   | (8.405)   | (6.079)   | (2.163)        |
| EM × Ln(INV)        | -0.041***             | -0.052***         | -0.041***       | -0.052***      | -0.021         | -0.017            | -0.021    | -0.017   | -0.021    | -0.017         | -0.021            | -0.017   | -0.021    | -0.017   | -0.021         |
| EM                  | 0.206**               | 0.207**           | 0.197**         | 0.182**        | 0.209**        | 0.211**           | 0.244     | 0.233    | 0.244     | 0.233          | 0.244            | 0.233    | 0.244     | 0.233    | 0.244          |
| Ln(Cases)           | 0.015                 |                   |                 |               |               |                   |           |          |           |               |                   |           |          |           |               |
| Amihud_M            | 0.075***              | 0.088***          | 0.088***        |               |               | 0.075***          | 0.088***  | 0.088***  | 0.088***  | 0.088***       | 0.075***          | 0.088***  | 0.088***  | 0.088***  |
|                     | (8.707)               | (8.882)           | (8.839)         |               |               | (8.600)           | (8.786)   | (8.786)   | (8.786)   | (8.786)        | (8.718)           | (8.882)   | (8.826)   |
| Nasdaq              | 0.592***              | 0.536***          | 0.537***        |               |               | 0.590***          | 0.534***  | 0.535***  | 0.535***  | 0.535***       | 0.592***          | 0.536***  | 0.537***  | 0.537***  |
|                     | (5.468)               | (5.049)           | (5.060)         |               |               | (5.452)           | (5.040)   | (5.043)   | (5.043)   | (5.043)        | (5.466)           | (5.051)   | (5.063)   |
| Ln(Price)           | -0.225***             | -0.299***         | -0.229***       |               |               | -0.223***         | -0.294*** | -0.295*** | -0.295*** | -0.295***       | -0.225***         | -0.298*** | -0.299*** |
|                     | (-5.037)              | (-6.157)          | (-6.177)        |               |               | (-4.984)          | (-6.080)  | (-6.089)  | (-6.089)  | (-6.089)        | (-5.048)          | (-6.162)  | (-6.173)  |
| Ln(Size)            | -0.393***             | -0.338***         | -0.338***       |               |               | -0.395***         | -0.340*** | -0.340*** | -0.340*** | -0.340***       | -0.393***         | -0.338*** | -0.338*** |
|                     | (-12.951)             | (-10.947)         | (-10.934)       |               |               | (-12.977)         | (-11.014) | (-10.983) | (-10.983) | (-10.983)       | (-12.950)         | (-10.951) | (-10.934) |
| Turnover            | -0.113**              | -0.126**          | -0.126**        |               |               | -0.113**          | -0.127**  | -0.127**  | -0.127**  | -0.127**        | -0.113**          | -0.126** | -0.125** |
|                     | (-2.372)              | (-1.978)          | (-1.980)        |               |               | (-2.405)          | (-2.000)  | (-1.991)  | (-1.991)  | (-1.991)        | (-2.375)          | (-1.979) | (-1.982) |
| ΔS&P500             | 0.020                 | -0.024            | -0.023          |               |               | -0.343**          | -0.323**  | -0.244    | -0.244    | -0.244          | 0.014             | -0.028   | -0.024   |
|                     | (0.131)               | (-0.155)          | (-0.150)        |               |               | (-2.228)          | (-2.073)  | (-1.548)  | (-1.548)  | (-1.548)        | (0.095)            | (-0.183) | (-0.161) |
| C                   | -5.938***             | -6.027***         | 1.577***        |               |               | -5.831***         | 5.969***  | -5.969*** | 5.969***  | -5.969***       | -5.938***         | 5.969***  | 5.969***  |
|                     | (-73.454)             | (-26.379)         | (2.901)         |               |               | (-74.566)         | (26.160)  | (3.010)   | (1.019)   | (1.022)         | (-73.116)         | (-26.374) | (2.900)   |
| Country FE          | No                    | Yes               | No              | No             | No             | Yes               | No        | No        | No        | No             | Yes               | No        | No        |
| Industry FE         | No                    | Yes               | Yes             | Yes            | Yes            | Yes               | Yes       | Yes       | Yes       | Yes            | No                | Yes       | Yes       |
| Robust SE           | Yes                   | Yes               | Yes             | Yes            | Yes            | Yes               | Yes       | Yes       | Yes       | Yes            | Yes               | Yes       | Yes       |
| N                   | 46,376                | 45,915            | 45,542          | 45,542         | 45,542         | 46,358            | 45,897    | 45,524    | 45,524    | 45,524         | 46,376            | 45,915    | 45,542    |
| RSQ                 | 0.011                 | 0.324             | 0.727           | 0.700          | 0.701          | 0.004             | 0.325     | 0.727     | 0.701     | 0.702          | 0.010             | 0.324     | 0.727     |

This table provides the results from the variations in the estimation of the following OLS regression specification.

\[
\text{Ln\_Spread}_i = \rho_0 + \rho_1 (\text{Ln\_INV})_i + \rho_2 (\text{EM} \times \text{Ln\_INV})_i + \rho_3 (\text{EM})_i + \rho_4 (\text{EM} \times \text{Cases})_i + \rho_5 (\text{Amihud\_M})_i + \rho_6 (\text{NASDAQ})_i + \rho_7 (\text{Ln\_Price})_i + \rho_8 (\text{Ln\_Size})_i + \rho_9 (\text{Turnover})_i + \rho_{10} (\Delta\text{S&P500})_i + \varepsilon_i
\]

The dependent variable is Ln\_Spread which is the natural log of Spread. The main independent variable of interest is Ln\_INV, which refers to the natural log of the Oxford Stringency, Economic Support and Containment Health Indexes, respectively. For remaining variable definitions please refer to Table 1. Robust T-stats corresponding to standard errors clustered at the ADR level are reported in parenthesis. ***, **, and * reflect statistical significance at 0.01, 0.05, and 0.10 levels, respectively.
### Table 3
Stringency Index and Volatility Regressions.

| Model | STRINGENCY Ln Volatility [1] | [2] | [3] | [4] | [5] | [1] | [2] | [3] | [4] | [5] | [1] | [2] | [3] | [4] | [5] |
|-------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|       | Ln(INV)                       | 0.171*** | 0.158*** | 0.151*** | 0.198*** | 0.144*** | 0.226*** | 0.276*** | 0.266*** | 0.176*** | 0.170*** | 0.159*** | 0.152*** | 0.193*** | 0.134*** |
|       | (21.861)                      | (22.827) | (17.577) | (8.879) | (22.248) | (25.826) | (22.922) | (25.568) | (14.507) | (21.929) | (22.248) | (22.776) | (17.672) | (9.649) |
|       | EM × Ln(INV)                  | -0.089*** | -0.113*** | -0.113*** | -0.005 | (6.145) | (8.141) | (1.121) | (6.622) | (8.199) | (6.622) | (8.199) | (6.622) | (8.199) | (6.622) |
|       | EM                            | 0.361*** | 0.364*** | 0.364*** | -0.015 | (6.877) | (6.917) | (7.896) | (5.735) | (6.758) | (6.829) | (6.758) | (6.829) | (6.758) | (6.829) |
|       | Lncases                       | 0.036*** | 0.046*** | 0.039*** | -0.019 | (4.912) | (13.586) | (6.893) |
|       | Amihud_M                      | -0.062*** | -0.066*** | -0.066*** | -0.019 | (4.912) | (13.586) | (6.893) |
|       | Nasdaq                        | 0.273*** | 0.313*** | 0.316*** | -0.019 | (4.912) | (13.586) | (6.893) |
|       | Ln(Price)                     | -0.236*** | -0.231*** | -0.233*** | -0.019 | (4.912) | (13.586) | (6.893) |
|       | Lncase                        | -0.015 | -0.032** | -0.031** | -0.019 | (4.912) | (13.586) | (6.893) |
|       | Turnover                      | 0.144* | 0.153* | 0.154* | -0.019 | (4.912) | (13.586) | (6.893) |
|       | ΔS&P500                       | -3.682*** | -4.167*** | -4.167*** | -3.603*** | -3.502*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** |
|       | C                             | -4.167*** | -4.167*** | -4.167*** | -3.603*** | -3.502*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** | -3.821*** |
|       | N                             | 46,376 | 45,915 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 | 45,542 |
|       | RSQ                           | 0.011 | 0.324 | 0.727 | 0.709 | 0.701 | 0.044 | 0.325 | 0.727 | 0.701 | 0.044 | 0.325 | 0.727 | 0.701 |

This table provides the results from the variations in the estimation of the following OLS regression specification:

\[
\text{Ln}\text{Volatility}_{it} = \beta_0 + \beta_1 (\text{Ln}\text{INV})_{it} + \beta_2 (\text{EM} \times \text{Ln}\text{INV})_{it} + \beta_3 (\text{EM})_{it} + \beta_4 (\text{Lncases})_{it} + \beta_5 (\text{Amihud}_M)_{it} + \beta_6 (\text{NASDAQ})_{it} + \beta_7 (\text{Ln}\text{Price})_{it} + \beta_8 (\text{Ln}\text{Size})_{it} + \beta_9 (\text{Turnover})_{it} + \beta_{10} (\Delta S&P500)_{it} + \epsilon_{it}
\]

The dependent variable is \text{Ln}\text{Volatility} which is the natural log of \text{Range}\text{Volatility} which is the natural log of \text{Range}\text{Volatility}. The main independent variable of interest is \text{Ln}\text{INV}, which refers to the natural log of the Oxford Stringency, Economic Support and Containment Health Indexes, respectively. For remaining variable definitions please refer to Table 1. Robust T-stats corresponding to standard errors clustered at the ADR level are reported in parenthesis. ***, **, and * reflect statistical significance at 0.01, 0.05, and 0.10 levels, respectively.
index ($\text{Ln INV}$). Economically, a one percent increase in home country stringency is associated with a 0.041% increase in ADRs spread. Model [5], shows similar results. The coefficient is 0.033 (p-value<0.05) is still both statistically and economically significant. However, as shown by the negative and statistically significant coefficient estimate on the $EM \times \text{Ln INV}$ interaction term, the effect of this type of intervention is muted in emerging markets.

Similar results are obtained for the impact of the Economic Support Index, with a positive coefficient of 0.085 [Model (3), p-value<0.01]. In economic terms, a one percent increase in home country economic support is associated with about a 0.085% increase in the illiquidity of the corresponding ADRs. Model [5], confirms the previous results an impact of 0.082 (p-value<0.05).

Also, the emerging market ADRs are generally more illiquid by 0.182% (p-value<0.05), while the coefficient on the interaction term $EM \times \text{Ln INV}$ is statistically insignificant, suggesting a similar impact of economic interventions on the liquidity in emerging markets as in developed markets. Regarding emerging markets, Harjoto et al. (2020) document negative returns in MSCI indices in response to Fed stimulus. However, they find the negative response is more pronounced in emerging markets. We document that the adverse response in market liquidity to economic government intervention is similar in developed and emerging markets.

Lastly, the results of the Containment and Health index impact are essentially similar to the aforementioned findings. Meaning, there is an adverse impact of the health interventions on ADRs spread. For the remaining control variables, Amihud Measure and Nasdaq dummy are positively related with $\text{Ln Spread}$ while Turnover and the Natural logs of Price and Size are negatively correlated with Spread. Similarly, there is a positive and statistically significant coefficient of 0.056 (p-value<0.01) on the Government Response Index (Appendix A3) suggesting an adverse impact of home country government interventions on the liquidity of ADRs. Additionally, similar to social government interventions (measured by the Stringency index), the effect of health interventions on liquidity is muted in emerging markets.

Next, we examine the relationship between interventions and the ADR-level Range Volatility, which follows the Alizadeh et al. (2002) measure, with the following regression specification:

$$
\text{Ln Volatility}_{it} = \beta_0 + \beta_1 (\text{Ln INV})_{it} + \beta_2 (EM \times \text{Ln INV})_{it} + \beta_3 (EM)_{it} + \beta_4 (Ln Cases)_{it} + \beta_5 (Amihud M)_{it} + \beta_6 (NASDAQ M)_{it} + \beta_7 (Ln Price)_{it} + \beta_8 (Ln Size)_{it} + \beta_9 (Turnover)_{it} + \beta_{10} (S&P500)_{it} + \epsilon_{it}
$$

Table 3 shows a coefficient of 0.151 [Model (3), p-value<0.01] on the natural log of stringency index. Thus, in economic terms, a one percent increase in home country stringency is associated with a 0.151% increase in ADRs volatility. In Model [5], the coefficient decreases to 0.144 (p-value<0.01), controlling for emerging markets.

Emerging market ADRs are more volatile vis-à-vis developed markets by 0.364% (p-value<0.01). The interaction term $EM \times \text{Ln Stringency}$ is significantly negative (-0.113, p-value<0.01). Meaning, the positive relation between social government intervention and volatility is milder in emerging markets. For the remaining controls, Turnover and Nasdaq dummy are positively related with $\text{Ln Range Volatility}$ while Amihud Measure, S&P500 Return and the Natural logs of Price and Size are negatively correlated with the range volatility measure.

As for the impact of the Economic intervention, we find a positive and statistically significant coefficient of 0.266 in Model [3]. Economically, a one percent increase in economic support is associated with 0.266% increase in volatility of the cross-listed securities. In Model [5], the coefficient becomes weaker in magnitude to 0.176 (p-value<0.01) but remains both statistically and economically significant. Emerging market ADRs are generally more volatile by 0.289% (p-value<0.01). Similar to previous results, the coefficient on the interaction term $EM \times \text{Ln INV}$ is statistically insignificant suggesting indifferent impact of economic interventions for emerging and developed markets.

Lastly, the impact of Health measures is positive and statistically significant across all models. This suggests an adverse impact of home country government interventions on the volatility of the corresponding cross-listed securities. The Government Response Index results suggest a similar interpretation (Appendix A3) that conforms to the former findings obtained for the overall government response index, the economic support index, and the stringency index. The overall government response index hint that governments’ measures are significantly associated with volatility and the Bid-Ask spreads. In economic terms, Model (3) suggests that a one percent increase in the overall government response index is associated with 0.151% (0.266%) increase in the Bid-Ask spread (volatility) of the cross-listed securities. Notably, the effect of Economic Interventions seems to have the major influence on ADRs volatility and liquidity among all types of interventions and markets.

Overall, the results lend further support to the idea that COVID-19 related government responses were associated with an increase in the volatility and liquidity of the ADRs. Taken together, the evidence highlights the effects of government interventions on the stability of cross-listed securities that seem to hold across both the developed and emerging markets.

4. Conclusions

This study presents the first attempt to examine the impact of COVID-19-related government policy interventions on cross-listed securities. Using comprehensive data from ADRs, we show that government interventions across countries are associated with an increase in ADRs volatility and widening their Bid-Ask spreads. These effects are robust when controlling for a wide variety of characteristics. Our results are in line with the prior studies and are also consistent with studies that suggest that regulatory restrictions impact the quality of financial markets (Pastor and Veronesi, 2012; Blau et al., 2014; Blau & Thomas, 2015; Blau, 2017).

It appears that Governments’ interventions could act as a double edge sword in the sense that, while their intended goal may be positive (e.g. pandemic containment and improving social welfare), their influence manifests negatively in the ADR market. This evidence may be of importance to government policymakers and regulators who wish to understand the spill over effects of
government intervention. Financial market participants may also incorporate this evidence into their portfolio allocations as governments intervene in social welfare in various ways.

CRediT authorship contribution statement

**David Y. Aharon:** Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing – original draft, Writing – review & editing. **Ahmed S. Baig:** Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing – original draft, Writing – review & editing. **R. Jared DeLisle:** Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing – original draft, Writing – review & editing.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2021.102276.

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