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The COVID-19 IMPACT on the ASIAN STOCK MARKETS

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In this note, we examine the impact that the COVID-19 crisis may have on the Asian stock markets by examining the statistical properties of three financial markets in Asia: namely, the Korean SE Kospi Index, the Japanese Nikkei 225, and the Chinese Shanghai Shenzhen CSI 300 Index. Using fractional integration methods, the results based on daily data indicate that mean reversion and thus transitory effects of shocks occur in the Nikkei 225 index. However, for the Kospi and Shanghai Shenzhen indices, this hypothesis is rejected, implying that shocks are permanent.

I. Introduction

The first case of COVID-19 was identified by the World Health Organization (WHO) on December 31, 2019 in Wuhan, China. The virus spread quickly, causing a pandemic that was declared on March 11, 2020 by the WHO. This pandemic is having a serious effect on global economies. Every stock market in the world has been affected and the Asian countries have experienced more negative abnormal returns as compared to other countries (Liu et al., 2020; Topcu & Gulal, 2020; etc.).

The literature shows a relationship between stock market returns and pandemic outbreaks (see, *inter alia*, AlAli, 2020; Bash, 2020; C.-D. Chen et al., 2009; M.-H. Chen et al., 2007; Ichev & Marinč, 2018; Park et al., 2008; and Pendell & Cho, 2013). Thus, many previous studies assert that the fluctuations in stock markets because of epidemics have brought significant economic losses to stock markets (see, *inter alia*, Bai, 2014; Baker et al., 2012; M.-H. Chen et al., 2007; M.-P. Chen et al., 2018; Del Giudice & Paltrinieri, 2017; Delisle, 2003; Macciocchi et al., 2016; Nippani & Washer, 2004; and Wang et al., 2013).

We also find several works that analyse the impact of COVID-19 on stock markets globally, such as Al-Awadhi et al. (2020), who find that the pandemic has negatively affected Chinese stock market returns. Alfaro et al. (2020) show that day-to-day changes in the predictions of standard models of infectious disease forecast changes in aggregate stock returns in the United States. Asraf (2020) examines the relationship between COVID-19 confirmed cases and deaths and stock market returns for 64 countries and he finds that stock markets responded negatively and quickly to the growth in COVID-19 confirmed cases.

Based on the above literature, it is important to examine whether the impact of COVID-19 on the stock market is temporary or permanent as this knowledge has implications for policy making. In this paper, we evaluate the effect of COVID-19 on selected Asian countries' stock markets, namely Japan, Korea and China. We use fractional integration methods as in many other studies based on the persistence of shocks (e.g., Gil-Alana & Moreno, 2009; Lovcha & Perez-Laborda, 2018).

II. Data and Methodology

We use daily prices data from three stock markets: The Korean SE Kospi Index, the Japanese Nikkei 225, and the Chinese Shanghai Shenzhen CSI 300 Index to assess the impact of COVID-19. The data cover the sample July 2006 to September 2020. The data-source is Refinitiv Eikon (Thomson Reuters).

With respect to the methodology, we use fractional integration or I(d) techniques, which are very appropriate methods if one is interested in determining the nature of shocks in a time series. Thus, allowing the degree of differentiation to be a real value, we can examine a variety of cases, including anti-persistence ($d < 0$); short memory ($d = 0$); stationary long memory ($0 < d < 0.5$); nonstationary mean reverting models ($0.5 \leqslant d < 1$); and no mean reverting cases ($d \geqslant 1$). Thus, from the perspective of the COVID-19 crisis, it is interesting to know if the series under examination displays values of d smaller than 1, in which case mean reversion occurs and shocks will have transitory effects.

III. Empirical results

The examined model is of the following form:

$$y_t = \beta_0 + \beta_1 t + x_t \qquad (1 - L)^d x_t = \mu_t \qquad t = 0, 1, \ldots \qquad (1)$$

where y_t refers to each of the three indices (in logs); β_0 and β_1 are unknown parameters for the intercept and the time trend, respectively, and x_t is I(d), where d is a real value also estimated from the data. In Table 1, we display the results under the assumption that μ_t in (1) is a white noise process, while in Table 2 weak autocorrelation is permitted.

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Table 1: d-estimates and 95% confidence intervals, white noise errors

Series	i) no terms	ii) with intercept	iii) with a time trend
Korea SE Kospi Index	1.03 (1.00, 1.06)	**1.03 (1.00, 1.06)**	1.03 (1.00, 1.06)
Nikkei 225 Index	1.00 (0.97, 1.02)	**0.87 (0.85, 0.90)**	0.87 (0.85, 0.90)
Shanghai Shenzhen CSI 300 Index	1.01 (0.98, 1.03)	**1.03 (1.00, 1.05)**	1.03 (1.00, 1.05)

This tables reports d-estimates with white noise errors. The values in parenthesis refer to the 95% non-rejection values of *d*. In bold the significant model according to the *t*-values on the deterministic terms is marked.

Table 2: d-estimates and 95% confidence intervals: Autocorrelated errors

Series	i) no terms	ii) with intercept	iii) with a time trend
Korea SE Kospi Index	1.01 (0.97, 1.05)	**1.00 (0.96, 1.05)**	1.03 (1.00, 1.06)
Nikkei 225 Index	0.99 (0.95, 1.04)	**0.95 (0.92, 0.99)**	0.87 (0.85, 0.90)
Shanghai Shenzhen CSI 300 Index	1.01 (0.98, 1.05)	**1.03 (1.00, 1.08)**	1.03 (1.00, 1.08)

This tables reports d-estimates with autocorrelated errors. The values in parenthesis refer to the 95% non-rejection values of *d*. In bold the significant model according to the *t*-values on the deterministic terms is marked.

In the two tables, we display the estimates of d and its corresponding 95% confidence interval for the three standard specifications in the unit root literature: i) with no deterministic terms; ii) only an intercept; and iii) with a linear time trend. We have marked in bold in the tables the most adequate specification for each series, based on the significance of these deterministic terms.

If μ_t is white noise, in Table 1 we see that the time trend is insignificant in the three series, the intercept being sufficient to describe the deterministic components. The most notorious thing observed here is that for the Kospi and Shanghai Shenzhen índices, the unit root hypothesis (i.e., $d = 1$) cannot be rejected since this value is included in the interval in the two series. However, for the Nikkei 225, this hypothesis is rejected in favor of mean reversion ($d < 1$) and the estimated value of d is 0.87, implying mean reversion though with very long-lasting effects.

Table 2 displays the results under the assumption of autocorrelated errors. Once more the I(1) hypothesis cannot be rejected for the Korean and Chinese indices but this hypothesis is rejected in favor of a small degree of mean reversion in case of the Nikkei 225. Note that the estimated value of d is now slightly higher at 0.95, but the interval excludes the value of 1, thus supporting mean reversion.

In the current context, facing the crisis caused by COVID-19, these results suggest that stronger measures must be adopted by the authorities in the cases of China and Korea, though for the Japanese Nikkei, the results indicate mean reversion and the effect of the shock will also be very long, thus requiring a long time to completely disappear.

IV. Conclusions

Three Asian stock markets have been examined in this paper by using the I(d) techniques in order to determine if shocks on the stock prices have permanent or transitory effects. The results support the hypothesis of mean reversion only in the case of the Japanese Nikkei 225, although even in this case the estimated value of d is large, implying long lasting effects of shocks.

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