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Examining Stock Market Co-Movement In The Pre, During, And Post-Covid Eras In Developing And Developed Markets

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Abstract

The COVID-19 epidemic disrupted global financial markets, requiring a thorough analysis of its effects on stock markets in underdeveloped and developed countries. The pre-COVID era (March 1, 2019, to February 28, 2020) provides a crucial baseline for market conditions before the pandemic. The during (March 1, 2020, to February 28, 2021) illuminates the crisis's immediate and tumultuous market responses. The post-COVID phase (March 1, 2021, to February 28, 2023) provides a critical vantage point to evaluate market recovery and long-term consequences as[1] economies adapt to the 'new normal.' Our research uses mean returns, standard deviations, variances, skewness, and kurtosis to provide return data distribution details. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests carefully evaluate time series data stationarity, revealing stock market resilience during difficult periods. This research provides a nuanced view of stock market reactions across locations and periods. These findings are crucial for politicians, investors, and academics navigating complex financial markets during unprecedented global crises. This research illuminates how to succeed in an ever-changing economic environment as financial markets change and face new difficulties. Our study helps us understand financial market behavior during crises, enabling educated decision-making and strategic planning in an uncertain time.

Keywords: Pre-Covid-19, During Covid-19, post-Covid-19, Co-movement, Developing Markets, Developed Markets, Stock Market.

Introduction

The COVID-19 epidemic began in China in December 2019 and devastated the worldwide economy by January 2020. This health crisis resembles prior epidemics, including the 1918 H1N1 virus, the 1957 and 1958 H2N2 virus, the 1968 H3N2 virus, the 2009–2010 Swine flu pandemic, the 2014–2016 Ebola pandemic, and the 2012 MERS pandemic. Like the COVID-19 pandemic, these prior epidemics had major consequences on many global economies, highlighting the interconnected world's susceptibility to infectious illnesses (Salisu et al., 2020).

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The quick spread of COVID-19 from Wuhan, China, to other countries highlights contemporary nations' interconnectedness. Global travel and commerce made the virus's capacity to cross borders easy, causing a rapid and widespread health disaster that required extraordinary efforts to manage it (Rothan & Byrareddy, 2020). The 1918 H1N1 pandemic, known as the Spanish flu, was among the worst in history. It caused millions of deaths and economic damage. The late 1950s H2N2 influenza pandemic and 1968 H3N2 pandemic also disrupted society and economy, albeit less so (Talenti et al., 2021).

The 2009–2010 H1N1 pandemic generated significant sickness and economic problems, showing how infectious viruses may affect the global economy. International collaboration in health emergencies was emphasized by the 2014–2016 Ebola pandemic in West Africa, which jeopardized lives, regional stability, and the economy (Jhaveri, 2020).

The 2012 Middle East Respiratory Syndrome (MERS) epidemic, caused by a new coronavirus, showed how a highly aggressive respiratory infection may affect a globally linked globe. MERS was more limited than COVID-19, but it showed how infectious infections may affect health systems and economies (Salisu et al., 2020).

Financial systems are disrupted during health, political, and economic crises. The COVID-19 epidemic caused worldwide commercial and economic upheaval, like previous crises. The epidemic caused global limitations, which slowed economic activity and brought the global economy near a depression. Revenues plummeted, increasing business debt and stock market volatility (Verma, 2023).

Song et al. (2021) noted that the recurrence of financial crises in global markets has increased interest in understanding the complex linkages between financial markets, particularly amid financial instability. In their research, Das and Gupta (2022) argued that global stock markets are highly interrelated and sensitive, especially where states have political or economic links. Events and shocks in one market may quickly ripple across borders and influence markets in other countries, generating a worldwide financial ripple effect.

The COVID-19 pandemic shows how such crises may devastate financial institutions and markets globally. Pandemic limitations and uncertainty disrupted supply networks, reassessed risks, and caused market volatility. Globalization and similar economic interests made these financial markets vulnerable to the pandemic's widespread effects (Alam et al., 2020; Wronka, 2022).

On May 28, 2020, the World Health Organization's Situation Report #129 reported 5,593,631 confirmed cases and 353,334 fatalities from the COVID-19 pandemic. These findings showed that the virus had a global effect on developed and developing countries. COVID-19 was a pandemic in 215 nations and territories. This report highlights the worldwide impact of the COVID-19 pandemic and the necessity for coordinated international responses to similar health disasters. The data in WHO's Situation Report #129 underline the need for a collective response to the virus, including healthcare, economic assistance, and vaccine and treatment development (WHO, 2020).

The International Monetary Fund (IMF) predicted a -3% global GDP drop in 2020. This GDP decrease projection was more difficult than the 2008-2009 global financial crisis (IMF, 2020). The 2008-2009 financial crisis shows how much the COVID-19 epidemic has hurt the economy. The 2008-2009 financial crisis, known as the Great Recession, was among the worst economic downturns in modern history. The pandemic's enormous economic concerns were highlighted by the expected GDP fall for 2020 (IMF, 2020).

COVID-19's influence on developing and developed market cointegration has yet to be studied. Only a few researchers, including Kumari and Jain (2021), Komariah et al. (2022), and Bhardwaj et al. (2022), have examined the COVID-19 impact on Asian markets. However, given the relevance of this problem and the lack of research, this study seeks to shed light on it.

This research seeks to understand better developing vs. developed market indexes from before, during, and after the COVID-19 epidemic. The research quantifies the association and co-movements of these indexes to determine how the pandemic may affect developing and developed economies' financial interdependence.

Proposed Methodology

This study will examine how the COVID-19 pandemic affected financial markets in developing and developed markets before, during, and after the epidemic. Our analysis relies on carefully collected historical stock market data. We will collect daily closing values of selected stock market indices, including PSX-100 (Pakistan), BSE (India), JKSE (Indonesia), S&P500 (USA), FTSE100 (UK), and TSX (Canada), for the predefined periods: Pre-COVID (March 1, 2019, to February 28, 2020), During the Pandemic (March 1, 2020, to February 28, 2021), and Post-COVID. We collected the data from Yahoo Finance.

Calculating investment or asset returns is crucial to this subject. The percentage return formula measures profits or losses relative to the starting investment or asset value. Descriptive statistics and Stationarity testing used to analyze the relations between the selected nations' stock market indices across the study period. Stationarity tested at the level and first difference using the Augmented Dickey-Fuller (ADF) test before examining time series data. Data normalcy and essential features determined through descriptive statistics. The 1988 Phillips–Perron (PP) test used with the ADF test to assess dataset stationarity fully.

This suggested technique allow us to rigorously and methodically examine how the COVID-19 pandemic affected stock markets in underdeveloped and developed nations, finding and comparing market responses throughout the epidemic's stages.

Literature review

Recent months have seen a dramatic increase in COVID-19 investigations. McKibbin and Fernando (2020) examined seven COVID-19 epidemiological scenarios and found that less developed nations with higher population densities and less advanced healthcare systems suffer more from the pandemic.

Eichenbaum, Rebelo, and Trabandt (2020) studied COVID-19's economic effects. Their data show the recession's severity and virus-related deaths are inescapable tradeoffs. Ma, Rogers, and Zhou (2020) also discuss how government fiscal policies affected GDP growth throughout the epidemic. They found that countries with more active fiscal policies may reduce negative GDP growth. Emerging economies are more prone to COVID-19 pandemic effects.

Baker et al. (2020) examined U.S. stock market volatility, concentrating on daily news items. Their analysis shows that COVID-19 has had a major influence on stock market volatility after February 24, 2020. Market dynamics changed at this time, with more instability and swings.

According to Barro, Ursúa, and Weng (2020), Baker and his colleagues argue that COVID-19 outbreaks might destabilize our global environment because of numerous crucial variables. The virus's virulence, propagation speed, fatality rate, and global interconnectivity are among these variables. These aspects create a vulnerable environment where even a single occurrence, like the COVID-19 pandemic, might have catastrophic effects, especially in financial markets.

Ramelli and Wagner (2020) examined U.S. business stock price responses from January to March 20, 2020, using an event research technique. Their investigation shed light on how the COVID-19 pandemic affected these companies. U.S. corporations exposed to China-related enterprises during the epidemic had negative abnormal returns. The epidemic era continued to plague these enterprises with poor results.

Ramelli and Wagner (2020) also observed that investor and analyst opinion grew particularly concerned with corporate debt levels and liquidity throughout the "feverish" stage of the crisis, indicating economic uncertainty's increased examination of financial soundness.

In another research, Yan (2020) analyzed COVID-19 market responses in Chinese A-share equities from January 20 to April 7, 2020. Yan (2020) found that COVID-19 negatively affected stock returns, but this effect reversed every ten days. The research found that larger enterprises were more resilient to pandemic shock. They were more resilient to supply chain interruptions and market instability due to their greater resources or possible monopolistic strength in some areas.

Few studies approaches build on Ramelli and Wagner (2020) and Yan (2020) by analyzing the effects of two key events during the COVID-19 pandemic: the WHO announcement of the pandemic and the Federal Reserve's economic stimulus. This research uses the event study technique to examine how global shocks affect stock indices, but we concentrate on the WHO's statement and the Fed's monetary policy actions.

As Ramelli and Wagner (2020) noted, the global pandemic and monetary policy announcements are events with clear, universally applicable dates that affect all companies listed in the market indices, making this study unique. This difference gives us a solid foundation to examine how these worldwide events affected investor mood, market dynamics, and financial performance throughout the stock market.

Based on institutional vacuum and Gao, Zuzul, and Jones (2017) and Khanna and Palepu (1997, 2011), the theory is that developing economies are more affected by the COVID-19 pandemic. This severity in developing markets is due to various variables. First, their fiscal and monetary policy infrastructures usually need to be more sophisticated, making it harder for them to react quickly to economic shocks. Second, they frequently have reduced liquidity, making it harder for investors to acquire and sell assets, which may increase market volatility. Third, information asymmetry in developing countries makes investment choices risky and unpredictable. Finally, their healthcare systems are less established, which may cause larger health-related disruptions that affect the economy (McKibbin and Fernando, 2020).

Given these factors, this study examines how the COVID-19 pandemic affected U.S. corporations of various market capitalizations. According to studies (Fazzari et al., 1988; Farre-Mensa and Ljungqvist, 2016; Kaplan and Zingales, 1997; Lamont, Polk, and Saá-Requejo, 2001), small enterprises have more capital limitations than bigger ones. Given this context and the Federal Reserve's stimulus measures to help small businesses, our study examines Cumulative Abnormal Returns (CARs) differences between U.S. companies with large market capitalizations and those with smaller ones.

Several empirical research have shown that global financial markets are interrelated. According to the Verma and Rani (2016), they studied Brazil, Russia, India, China, and South Korea's complex financial markets. Their research extended beyond observation to examine how shocks affect market cointegration. Importantly, their data confirmed causal linkages between various financial markets. These studies show how events, shocks, and economic changes in one market may affect another, proving worldwide financial markets are interconnected. Empirical evidence supports the idea that investors, politicians, and financial analysts must comprehend these intricate interrelationships to manage the world's financial systems.

Papavassiliou (2014) found long-term equilibrium in Montenegro, Western Europe, and the U.S. financial markets. This shows long-term market links. Seth and Sharma (2015) found

linkages and long-term integration between U.S. and Asian stock markets, demonstrating dependency over time.

Chong, Drew, and Veeraraghavan (2003) established short-term and long-term links between the Australian and U.S. markets, demonstrating their interdependence. Gilmore and McManus (2004) found cointegration between Canada, Mexico, and the U.S. stock markets, indicating a long-term link.

In contrast, Vo and Daly (2005) found no long-term association between Asian and advanced industrial stock market indexes, indicating greater independence or irregular correlations. Thomas et al. (2017) examined the Asia-Pacific frontier, developing and establishing long-term market equilibrium connections. They found that rising markets like Thailand and China and frontier countries like Pakistan and Sri Lanka differed from other Asia-Pacific markets. Frontier and developing markets also affected established markets, showing the intricate relationship between market levels. These above studies show that financial market interactions are complex, with different degrees of integration, cointegration, and independence. The complexities of these linkages affect global investors, portfolio diversification, risk management, and understanding how events in one area might affect the worldwide financial system.

Parker and Rapp (1998) state that efficient markets have no long-term stock index movement. Thus, examining the degree of movement between one market and other worldwide markets may help evaluate financial market efficiency. Cointegration test findings reveal the dynamic link between the two markets' stock prices.

Huang and Fok (2001) noted that investors may be able to predict the stock prices of one market by examining the stock price information of the other market if two series of stock prices are synchrony over a certain period but diverge during external shocks or disturbances.

This emphasizes the relevance of market interaction and investor ramifications. Movement across markets may be reduced in inefficient markets where asset prices reflect information quickly and correctly. Conversely, departures from this movement, especially during external shocks, might allow investors to obtain insights and make educated investment choices by evaluating market relationships. This emphasizes market efficiency and movement analysis in financial market assessment and navigation.

Panda and Nanda (2017) examined South and Central American financial markets. Their research revealed a long-term equilibrium link between this region's main stock markets. Their studies also showed that Argentina, Venezuela, Chile, and Brazil stock market returns were highly interdependent.

Boamah (2017) noted the extent of global integration in emerging countries compared to neighboring integration. The research found that developing economies were more integrated globally than internally, indicating their connectivity with the global financial environment.

Roy and Sen (2019) examined the movements and cointegration of Nifty, DJI (Dow Jones), and N225. They found coordinated short-term movement among these indices, indicating market dynamics-related reactions. The study found long-term cointegration between these indicators, indicating a strong and lasting link. High correlation and significant cointegration showed the indexes' interconnection and financial fluctuations.

These numerous study results help us to comprehend how financial markets across regions interact, whether via long-term equilibrium connections, reciprocal effects, global integration

trends, or synchronous important indicators. Such insights help investors, analysts, and politicians manage the complicated global financial system.

Crises influence the interconnection and interdependence of global stock markets. Scholars worldwide have studied the COVID-19 pandemic. Fernandez-Perez, Gilbert, Indriawan, & Nguyen (2021), Zhang, Gao, & Li (2021), Al-Awadhi, Alsaifi, & Alhammadi (2020), Liu, Choo, & Lee (2020), and Topcu et al. (2020) have conducted comprehensive studies that illuminate the pandemic's profound impact on global financial markets.

This research reveals that the COVID-19 pandemic has had a major impact on global financial markets. Pandemic-induced disruptions have had unparalleled effects on investor mood, market volatility, asset prices, and trade. This study highlights the far-reaching effects of global crises and the necessity for rigorous analysis, risk management measures, and governmental actions to reduce their effects on finance.

Kumari and Jain (2021) examined South East Asian stock index cointegration before and during the COVID-19 pandemic. They found strong evidence of a long-term connection between these indicators before and throughout the crisis. Short-term cointegration changed over this time, highlighting the dynamic character of these interactions during the crisis.

Habiba, Peilong, Zhang, and Hamid (2020) examined long-term stock market integration in the U.S. and South Asian developing nations. They examined pre-, during-, and post-crisis periods. Their results showed that long-term integration intertwined these markets during the crisis.

The COVID-19 pandemic has had a greater effect on the global financial industry than previous pandemics. This worldwide health catastrophe has enormous repercussions on even the wealthiest countries. Thus, this research examines Asian stock market links during the COVID-19 epidemic.

This research adds to the field by investigating the cointegration of Asian main stock indexes pre-, during-, post-, and post-crisis. Its comparison of stock market interconnection during the COVID-19 pandemic with analogous times in years before and after the epidemic sets it distinct. This unique and helpful comparative research illuminates how the pandemic has altered Asian stock market interrelationships throughout time.

By examining these relationships and their development, this research helps us understand how financial markets react to exceptional occurrences like the COVID-19 epidemic. These insights guide investment, risk management, and policy choices in a changing global financial ecosystem.

Methodology

Sample and Data

This article examines how the COVID-19 pandemic affected the stock markets of three developing and three developing stock market pre-, during, and post-pandemic. Pakistan (PSX-100), India (BSE), and Indonesia (JSK) are growing markets, whereas the USA (NYSE), Canada (TSX), and the UK (LSX) are established markets.

- Pre-COVID Period (1st March 2019–28th February 2020): This period provides a baseline for market circumstances before the pandemic.
- During the pandemic (1st March 2020 – 28th February 2021): This phase highlights the immediate and tumultuous effect of the pandemic on global financial markets, revealing how each market reacted to the crisis.

- Post-COVID (1st March 2021–28th February 2023): This time lets us examine stock market recovery, stability, and long-term consequences to see how markets adjusted to the 'new normal' post-pandemic.

The research examines stock market measures, including indices, volatility, trading volumes, and price fluctuations, to determine the pandemic's impact. We want to evaluate the pandemic's influence on global financial systems and identify noteworthy market reactions by comparing and contrasting established and emerging economies over these three periods.

Data Source

Our present analysis uses daily index closing values as the key dataset. Data was carefully gathered from Yahoo Finance for dependability and consistency. A cautious approach was used to remedy data gaps when indices were absent on certain days. Data continuity and integrity were maintained throughout the investigation by replacing missing indices with their previous day's values. In table 1, the list of the countries and markets are mentioned.

The return formula calculates investment or asset returns. It measures the gain or loss as a percentage of the original investment or asset value. The formula used to compute basic, logarithmic, and annualized returns relies on the context and kind of return.

Simple Return= (Final Value−Initial Value)

"Final Value" represents the value of the investment or asset at the end of the investment period.

"Initial Value" represents the initial amount invested or the starting value of the asset.

The difference between the final and initial values represents the gain (if positive) or loss (if negative) over the investment period.

The division by the initial value normalizes the return, expressing it as a percentage of the initial investment.

Sr No	Symbol	Nation
Developing		
1	PSX-100	Pakistan
2	BSE	India
3	JKSE	Indonesia
Developed		
1	S&P 500	USA
2	FTSE100	UK
3	TSX	Canada

Table 1: Selected developed and developing countries

Econometrics

We performed descriptive statistics and stationarity tests to determine the level of interconnection among the stock market indices of the identified countries throughout our research period.

This research uses time series data from several market indexes; hence, stationarity must be checked before further studies. We used the Augmented Dickey-Fuller (ADF) test to assess stationarity at the level and first difference.

Descriptive statistics were used to analyze the dataset's normality and essential properties. The research also used a correlation test to examine variable connections. The ADF (1979) test and PP (1988) test were used to examine dataset stationarity.

Results

	Mean	Std. Dev.	Variance	Skewness	Kurtosis
Developing					
(PSX)- Pre	-0.000037	0.0123132	0.0001516	0.1625469	2.987904
During	0.0008664	0.0146965	0.000216	-1.22495	8.891472
Post	-0.0002006	0.0099129	0.0000983	-0.3585967	5.139894
(Indian)-Pre	0.000312	0.009344	0.0000873	0.7287356	8.272706
During	0.0012125	0.0205411	0.0004219	-1.275983	12.9768
Post	0.0004171	0.0098758	0.0000975	-0.3653972	4.467421
(Indonesia)-Pre	-0.0006499	0.0075517	0.000057	-0.3466443	3.505424
During	0.0007143	0.017296	0.0002992	0.2072954	8.96053
Post	0.0002173	0.0079249	0.0000628	-0.4774036	5.259397
Developed					
(UK)-Pre	-0.0002526	0.0081724	0.0000668	-1.215392	6.450608
During	0.00011	0.0183266	0.0003359	-0.7543192	10.52683
Post	0.0004258	0.0089012	0.0000792	-.4775279	5.944869
(U.S) – S&P Pre	0.000271	0.0084868	0.000072	-1.484959	7.825304
During	0.0012485	0.0215424	0.0004641	-0.5696145	11.17985
Post	0.0001564	0.0122764	0.0001507	-0.0864756	4.273704
(Canada) – Pre	0.0000787	0.0051804	0.0000268	-1.602706	8.721439
During	0.0006398	0.0208762	0.0004358	-0.9214624	17.3467
Post	0.0002612	0.0084927	0.0000721	-0.2263788	4.21232

Table 2: Summary Statistics

Augmented Dickey-Fuller (ADF) Test

The Augmented Dickey-Fuller (ADF) test detects stationary or non-stationary data in time series analysis. Many time series modeling methods assume stationarity and the ADF test helps researchers determine whether a data series fits this assumption.

The main goal of the ADF test is to detect unit roots in time series. A unit root denotes a stochastic, non-stationary time series. Non-stationary data might change means, variances, or other features, making statistical and economic studies difficult.

$$\Delta yt=\alpha+\beta t+\gamma yt-1+\delta 1\Delta yt-1+\delta 2\Delta yt-2+\ldots+\delta p\Delta yt-p+\varepsilon t$$

The ADF test equation uses Δyt to describe time series data differences. This differencing is necessary to create a new time series where each data point signifies a change from the preceding one. Stabilizing the data makes statistical analysis easier.

The α term represents the equation's intercept. It represents the time series baseline. It represents the time series' fluctuating value.

The βt term identifies linear trends in data. Trends may be upward or downward, and βt measures their slope over time. It helps determine whether the time series increases or decreases with time.

The γ term measures the coefficient of the lagged dependent variable. This word examines the link between current and prior data points. It helps examine how previous time series values impact its present condition, vital for understanding data pattern persistence.

Lagged differenced values of the time series are represented by coefficients δ1, δ2,..., δp. These coefficients show how previous time series modifications affect its current condition. The ADF test accommodates data temporal dependencies by incorporating multiple lagged terms (up to p delays).

Finally, the error term (εt) compensates for data fluctuation or noise. It is important to note that the ADF test equation cannot explain all-time series changes.

Phillips-Perron (PP) Tests

Phillips-Perron (PP) is another statistical time series data analysis test, like the Augmented Dickey-Fuller (ADF) test. The ADF and PP tests assess whether a time series is stationary or non-stationary. Time series analysis relies on stationarity since many models are based on it.

This equation underpins the PP test:

$\Delta yt=\alpha+\rho yt-1+\sum i=1p\beta i\Delta ut-i+\varepsilon t$

The PP test equation's components are explained:

As with the ADF test, Δyt represents the differenced time series data. It calculates discrepancies between observations to stabilize data.

The intercept term (α) represents a constant or baseline level in the time series.

Define ρ as the coefficient of the lagged dependent variable y_{t-1}. Like the ADF test, it evaluates how previous time series values impact its present condition.

The total of delayed differenced white noise terms is Σβ_i Δu_{t-i}. Previous white noise (residual) modifications affect the time series' present condition.

The ADF test uses the error term εt to account for unexplained variability or noise in data.

PP test null hypothesis: time series has a unit root, showing non-stationarity. If the test statistic exceeds the crucial value, the null hypothesis is not rejected, indicating a non-stationary time series. A test statistic below the crucial value rejects the null hypothesis, showing stationarity.

PP is a variant of the ADF test that is more resilient in cases of heteroscedasticity or autocorrelation. It is commonly used in econometrics and financial analysis to analyze time series data stationarity before modeling.

Dataset	ADF test	PP test
Developing		
(PSX)- Pre	-14.423***	-14.431***
During	-13.549***	-11.029***
Post	-22.054***	-14.451***
(Indian)-Pre	-14.722***	-14.729***
During	-17.800***	-15.336***
Post	-21.228***	-12.575***
(Indonesia)- Pre	-13.232***	-13.216***
During	-15.279***	-14.424***
Post	-21.238***	-15.247***

Developed		
(UK)-Pre	-12.396***	-12.384***
During	-15.765***	-13.099***
Post	-21.585***	-16.969***
(U.S) – S&P Pre	-13.594***	-13.595***
During	-22.310***	-18.062***
Post	-19.686***	-12.394***
(Canada) – Pre	-9.298***	-9.349***
During	-19.747***	-16.822***
Post	-18.841***	-14.023***

Table 3: Stationary Test

Statistically significant at 1%

Findings

Table 1 shows that the stock market indexes from emerging and developed countries indicate their economic health and financial stability. The PSX-100 reflects Pakistan's stock market in the developing category, revealing its economy. The BSE (Bombay Stock Exchange) shows India's economic progress and potential as the world's second-most populous country. Indonesia's dynamic economy makes the JKSE (Jakarta Composite Index) an important benchmark for Southeast Asian investors. The developed category's S&P 500, a classic U.S. index, tracks 500 of the biggest U.S. stock market businesses. The U.K.'s stock market benchmark is the FTSE 100, whereas Canada's resource-rich economy is reflected in the TSX.

Table 2 includes mean, standard deviation, variance, skewness, and kurtosis for different areas and historical periods. These measurements provide data distribution and characteristics by area and time. During the "Pre" period for (PSX) in developing nations, the mean return is near zero, implying no directional bias in returns. Moderate standard deviation and positive skewness indicate moderate volatility and a little rightward tail in the return distribution, suggesting extreme positive returns are less common than extreme negative returns. The return distribution's broader tails than a normal distribution may suggest more extreme values, as seen by the kurtosis value 2.99.

In the "During" period in the same region (PSX), the mean return is positive, indicating an average positive return. At the same time, the negative skewness and high kurtosis value of 8.89 suggest a leftward tail and heavier tails than a normal distribution. This suggests outliers and excessive return values.

PSX has a slightly negative mean return with moderate skewness and kurtosis values in the "Post" period, suggesting a symmetric distribution with considerable tail behavior.

This analysis repeated for various areas and periods to comprehend return data statistics fully. These statistics help investors and analysts evaluate financial data distribution and risk and return profiles by revealing regional and time segment risk and return profiles.

Table 3 includes Augmented Dickey-Fuller (ADF) and Phillips-Perron (P.P.) unit root test findings for different areas and periods, with asterisks (***) indicating 1% significance.

In developing nations, particularly the (PSX) area, the ADF and P.P. tests consistently produced significant and negative test statistics pre-, During, and Post. These findings indicate that (PSX) time series data are stationary in each temporal segment, suggesting the lack of a unit root and supporting the idea that the data are stable over these periods.

The ADF and P.P. tests for (India) and (Indonesia) generated significant and negative test statistics in several periods, demonstrating time series data stationarity. The data in these locations is constant without trend or drift.

In developed nations, the U.K. had substantial and negative ADF and P.P. test statistics for pre-, for, and Post periods, showing time series data stationarity. This shows that (the U.K.) was steady across these periods.

In the (U.S.) – S&P area, the ADF and P.P. tests produced extremely significant and negative test statistics for pre- and for, indicating stagnant data. The ADF test remained significant during the post-period, while the P.P. test dropped. This may indicate a shift in time series data stationarity in the post-period.

Finally, (Canada)'s ADF and P.P. tests consistently yielded significant and negative test statistics throughout the pre-, throughout, and post-periods, suggesting stationary data and stable features.

Conclusion

In this extensive research, we examined the influence of the COVID-19 pandemic on developing and developed country stock markets pre-, during, and post-pandemic. We also examined return data statistics and performed Augmented Dickey-Fuller (ADF) and Phillips-Perron (P.P.) unit root tests to determine time series data stationarity across geographies and segments. The stock market indexes analyzed in this research are important indicators of their respective countries' economic health and financial stability. These benchmarks indicate economic growth and investment opportunities in developing countries like Pakistan (PSX-100), India (BSE), and Indonesia (JKSE) and established markets like the U.S. (S&P 500), the U.K. (FTSE 100) and Canada (TSX).

The statistical metrics provide insight into the distribution and features of return data across locations and historical eras. During the "Pre" period for (PSX) in emerging countries, the near-zero mean return indicates no directional bias. However, significant standard deviation and positive skewness imply considerable volatility and a little rightward tail. Higher kurtosis indicates more dramatic returns.

The "During" period in the same area (PSX) shows a positive mean return, suggesting an average positive return. Negative skewness and considerably greater kurtosis suggest leftward tails and heavier tails than a normal distribution, signifying outliers and extreme return values.

In the "Post" period for (PSX), the mean return is slightly negative with considerable skewness and kurtosis, suggesting a symmetric distribution with significant tail behavior. A similar analysis for various geographies and periods may provide risk and return profiles by segment and area.

Using Augmented Dickey-Fuller (ADF) and Phillips-Perron (P.P.) unit root tests, evaluates the stationarity of time series data across geographies and periods.

In developing countries like the (PSX) area, the ADF and P.P. tests regularly produced significant and strongly negative test statistics pre-, During, and Post. These results indicate that (PSX) time series data are stationary in each temporal segment, showing stability without a unit root.

Indian and Indonesian areas had significant and negative test statistics in numerous periods, confirming time series data stationarity. These results suggest these locations' data behaved consistently without significant anomalies. In wealthy countries, the U.K. had large and

negative ADF and P.P. test statistics, indicating stability throughout the pre-, throughout, and Post periods.

ADF and P.P. tests in the (U.S.) S&P area yielded significant negative test statistics during pre- and During periods, supporting data stationarity. The post-period ADF test remained significant, but the P.P. test's significance level declined, suggesting a change in time series data stationarity.

For (Canada), the ADF and P.P. tests consistently produced significant and negative test statistics pre-, During, and post-, indicating stationary data and stable features.

In conclusion, this study provides insights into the influence of the COVID-19 pandemic on stock markets across locations and timeframes. In the face of enormous difficulties, emerging and established markets showed tenacity and adaptation. Statistics and unit root tests help investors, analysts, and regulators make educated choices in dynamic financial markets by analyzing risk and return profiles and time series data stationarity. These results highlight the complexity of financial markets throughout crises and recovery, underlining the need for ongoing monitoring and analysis to navigate shifting economic environments.

Future studies in this field should delve deeper into the nuanced responses of stock markets to various external shocks, such as pandemics, economic recessions, or geopolitical events. Additionally, a comparative analysis of emerging and developed markets during such crises would provide valuable insights into the factors influencing market resilience and vulnerability. Moreover, researchers should explore the effectiveness of different policy interventions in stabilizing financial markets and the long-term consequences of these measures. As financial markets evolve and face new challenges, future studies can contribute to a better understanding of market dynamics and developing strategies to navigate uncertain economic landscapes.

Since the pandemic affected various regions differently, policymakers should prioritize economic resilience programs. Diversifying economic sectors, promoting innovation, and investing in healthcare and education may reduce economic shocks. Establish effective monitoring and response tools to discover economic weaknesses early. Regular stock market developments and economic indicator linkages may inform prompt responses.

Policies that boost investor confidence are crucial. Publicly communicating government and economic policy during crises helps calm markets. Investors need government guarantees of market stability. Increase market monitoring to avoid manipulation and increase openness. This might involve limiting speculating and using circuit breakers during market instability. Establish financial safety nets or emergency reaction funds to stabilize markets during crises. These funds boost market liquidity, stabilize asset prices, and cushion shocks. Promote economic diversity in emerging countries to decrease industry reliance. Spreading risk helps a diverse economy withstand pandemics. Financial literacy and education initiatives help investors and the public understand financial markets. Informing investors reduces crisis-related panic selling.

Develop data analysis and research skills to monitor market trends and vulnerabilities. Data and analysis should guide policymaking. Global crisis response should be coordinated internationally. Financial markets are interdependent; therefore, governments and regulators must work together to solve cross-border issues. Plan for several crises in detail. These strategies should describe quick measures and policies to minimize financial market disasters. Promote long-term sustainable and resilient investment solutions. Market stability may be achieved by encouraging long-term investment over speculation.

References

Alam, M. S., Ali, M. J., Bhuiyan, A. B., Solaiman, M., & Rahman, M. A. (2020). The impact of covid-19 pandemic on the economic growth in Bangladesh: a conceptual review. American Economic & Social Review, 6(2), 1-12.
Al-Awadhi, A. M., Alsaifi, K., Al-Awadhi, A., & Alhammadi, S. (2020). Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. Journal of Behavioral and Experimental Finance, 27, 100326.

Ansotegui, C., & Esteban, M. V. (2002). Cointegration for market forecast in the Spanish stock market. Applied Economics, 34(7), 843–857.

Baker, S. R., Bloom, N., Davis, S. J., Kost, K. J., Sammon, M. C., Viratyosin, T., 2020. The unprecedented stock market impact of COVID-19. Nat. Bur. Econ. Res working papers, No. w26945.

Barro, R.J., Ursúa, J.F., Weng, J., 2020. The coronavirus and the great influenza pandemic: lessons from the "Spanish Flu" for the coronavirus's potential effects on mortality and economic activity. Nat. Bur. Econ. Res working papers, No. w26866.

Bhardwaj, N., Sharma, N., & Mavi, A. K. (2022). Impact of COVID-19 on long run and short run financial integration among emerging Asian stock markets. Business, Management and Economics Engineering, 20(2), 189–206.

Boamah, N. A. (2017). The global financial market integration of selected emerging markets. International Journal of Emerging Markets, 12(4), 683–707.

Chong, L., Drew, M., & Veeraraghavan, M. (2003). Stock market interdependence: Evidence from Australia. Pacific Accounting Review, 15(2), 51–76.

Chong, L., Drew, M., & Veeraraghavan, M. (2003). Stock market interdependence: Evidence from Australia. Pacific Accounting Review, 15(2), 51–76.

Das, A., & Gupta, A. (2022). Comovement of stock markets after the first COVID wave: A study into five most affected countries. IIM Ranchi Journal of Management Studies.

Das, A., & Gupta, A. (2022). Comovement of stock markets after the first COVID wave: A study into five most affected countries. IIM Ranchi Journal of Management Studies.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American statistical association, 74(366a), 427-431.
Eichenbaum, M. S., Rebelo, S., Trabandt, M., 2020. The macroeconomics of epidemics. Nat. Bur. Econ. Res working papers, No. w26882.

Farre-Mensa, J., Ljungqvist, A., 2016. Do measures of financial constraints measure financial constraints? Rev. of Fin. Studies 29, 271-308.

Fazzari, S., Hubbard, G. B., Petersen, B., 1988. Financing constraints and corporate investment. Brook. Pap. On Econ. Act. 19, 141-206.

Fernandez-Perez, A., Gilbert, A., Indriawan, I., & Nguyen, N. H. (2021). COVID-19 pandemic and stock market response: A culture effect. Journal of Behavioral and Experimental Finance, 29, 100454.

Gao, C., Zuzul, T., Jones, G., Khanna, T., 2017. Overcoming institutional voids: A reputationbased view of long-term survival. Strat. Manag. J. 38, 2147-2167.

Gilmore, C. G., & McManus, G. M. (2004). The impact of NAFTA on the integration of the Canadian, Mexican, and US equity markets. In North American economic and financial integration. Vol. 10 (pp. 137-151). Emerald Group Publishing.

Granger, C. J. (1986). Developments in the study of cointegrated economic variables. Oxford Bulletin of Economics and Statistics, 48(3), 213–228.

Gulzar, S., Mujtaba Kayani, G., Xiaofen, H., Ayub, U., & Rafique, A. (2019). Financial cointegration and spillover effect of global financial crisis: A study of emerging asian financial markets. Economic Research-Ekonomska Istrazivanja, 32(1), 187–218

Habiba, U. E., Peilong, S., Zhang, W., & Hamid, K. (2020). International stock markets integration and dynamics of volatility spillover between the USA and South Asian markets: Evidence from global financial crisis. Journal of Asia Business Studies, 14(5), 779–794.

Huang, B. N., & Fok, R. C. (2001). Stock market integration-an application of the stochastic permanent breaks model. Applied Economics Letters, 8(11), 725–729.

International Monetary Fund (IMF), 2020. The Great Lockdown. World Economic Outlook, April, 2020. Available at https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020

Jhaveri, R., 2020. Echoes of 2009 H1N1 influenza pandemic in the COVID pandemic. Clinical therapeutics, 42(5), pp.736-740.

Johansen, S. (1988). Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12(2-3), 231–254.

Kaplan, S. N., Zingales, L., 1997. Do investment - cash flow sensitivities provide useful measures of financial constraints? Quar. J. of Econ. 112, 169-215.

Kasa, K. (1992). Common stochastic trends in international stock markets. Journal of Monetary Economics, 29(1), 95–124.

Khanna, T., & Palepu, K. G., 2011. Winning in emerging markets: Spotting and responding to institutional voids. World Fin. Rev. May-June, 18-20.

Khanna, T., Palepu, K. G., 1997. Why focused strategies may be wrong for emerging markets. Har. Bus. Rev. 75, 41–51.

Komariah, S., Mulyani, I. S., Afriandi, F., Indriani, P., & Septiana, A. E. (2022). Stock exchange cointegration in developed and developing countries in Asia during the covid-19 pandemic. Review of International Geographical Education Online, 12(1), 674–682.

Kumari, S., & Jain, V. (2021). Integration between South East Asian stock markets before and during the occurrence of covid-19. Ilkogretim Online, 20(1), 2065–2074.

Kumari, S., & Jain, V. (2021). Integration between South East Asian stock markets before and during the occurrence of covid-19. Ilkogretim Online, 20(1), 2065–2074.

Lamont, O., Polk, C., Saaá-Requejo, J., 2001. Financial constraints and stock returns. Rev. of Fin. Studies 14, 529-554.

Liu, M., Choo, W. C., & Lee, C. C. (2020). The response of the stock market to the announcement of global pandemic. Emerging Markets Finance and Trade, 56(15), 3562–3577.

Liu, X., Song, H., & Romilly, P. (1997). Are Chinese stock markets efficient? A cointegration and causality analysis. Applied Economics Letters, 4(8), 511–515.

Ma, C., Rogers, J., Zhou, S. 2020. Global economic and financial effects of the 21st century pandemics and epidemics. Working paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3565646.

McKibbin, W., Fernando, R., 2020. The global macroeconomic impacts of COVID-19: Seven scenarios. Cama working paper 19/2020. Australian National University. Available at https://www.brookings.edu/wp-content/uploads/2020/03/20200302_COVID19.pdf.

McKibbin, W., Fernando, R., 2020. The global macroeconomic impacts of COVID-19: Seven scenarios. Cama working paper 19/2020. Australian National University. Available at https://www.brookings.edu/wp-content/uploads/2020/03/20200302_COVID19.pdf.

Panda, A. K., & Nanda, S. (2017). Market linkages and conditional correlation between the stock markets of South and Central America. Journal of Financial Economic Policy, 9(02), 174–197.

Papavassiliou, V. G. (2014). Equity market integration: The new emerging economy of Montenegro. Review of Accounting and Finance, 13(3), 291–306.

Parker, M. E., & Rapp, T. (1998). An empirical investigation of the comovement between stock market indexes. Studies in Economics and Finance, 19(1/2), 108–122.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. biometrika, 75(2), 335-346.
Ramelli, S., Wagner, A. F. 2020. Feverish stock price reactions to COVID-19. Swiss Finance Institute Research Paper No. 20-12. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3550274.

Rothan, H. A., & Byrareddy, S. N. (2020). The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. Journal of autoimmunity, 109, 102433.
Roy, A. S., & Sen, S. S. (2019). Co-Movement and Co-integration: A study on nifty, dow jones, and N225. In The Gains and Pains of Financial Integration and Trade Liberalization (pp. 169–181). Emerald Publishing.

Salisu, A. A., Sikiru, A. A., & Vo, X. V. (2020). Pandemics and the emerging stock markets. Borsa Istanbul Review, 20, S40–S48.

Seth, N., & Sharma, A. K. (2015). International stock market efficiency and integration: Evidences from asian and US markets. Journal of Advances in Management Research.

Song, G., Xia, Z., Basheer, M. F., & Shah, S. M. A. (2021). Co-Movement dynamics of US and Chinese stock market: Evidence from COVID-19 crisis. Economic Research-Ekonomska Istrazivanja, 35(1), 2460–2476.

Taylor, M. P., & Tonks, I. (1989). The internationalisation of stock markets and the abolition of UK exchange control. The Review of Economics and Statistics, 332–336.

Telenti, A., Arvin, A., Corey, L., Corti, D., Diamond, M. S., García-Sastre, A., ... & Virgin, H. W. (2021). After the pandemic: perspectives on the future trajectory of COVID-19. Nature, 596(7873), 495-504.
Thomas, N. M., Kashiramka, S., & Yadav, S. S. (2017). Dynamic linkages among developed, emerging and frontier capital markets of Asia-Pacific region. Journal of Advances in Management Research, 14(3), 332–351.

Topcu, M., & Gulal, O. S. (2020). The impact of COVID-19 on emerging stock markets. Finance Research Letters, 36, 101691.

Verma, R. P., & Rani, P. (2016). Emerging stock market integration in the post financial crises era: An empirical analysis of the short-term and long-term linkages. Emerging Economy Studies, 2(1), 91–109.

Verma, R., 2023. Comovement of stock markets pre-and post-COVID-19 pandemic: a study of Asian markets. IIM Ranchi journal of management studies.

Vo, X. V., & Daly, K. J. (2005). International financial integration: An empirical investigation into asian equity markets pre-and post-1997 asian financial crisis. In Asia Pacific financial markets in comparative perspective: Issues and implications for the 21st century (pp. 75–100). Emerald Group Publishing Limited.

World Health Organization (WHO), 2020. Coronavirus disease. Situation Report 129. Available at https://www.who.int/docs/default-source/coronaviruse/situationreports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880_2

Wronka, C., 2022. Impact of COVID-19 on financial institutions: Navigating the global emerging patterns of financial crime. Journal of Financial Crime, 29(2), pp.476-490.

Yan. C., 2020. COVID-19 outbreak and stock prices: Evidence from China. Zhongnan University of Economics and Law Working Paper. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3574374.

Yang, F. (2012). A note on cointegration methodology in studying stock markets integration. Applied Economics Letters, 19(16), 1583–1586.

Zhang, P., Gao, J., & Li, X. (2021). Stock liquidity and firm value in the time of COVID-19 pandemic. Emerging Markets Finance and Trade, 57(6), 1578–1591.