



Evaluating economic recovery by measuring the COVID-19 spillover impact on business practices: evidence from Asian markets intermediaries

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Abstract

The COVID-19 outbreak significantly affected the global economy and energy markets. To mitigate the shock, maintain financial market stability, and encourage economic recovery, this study investigates the influence of post-COVID-19 on monetary policy transmission to business practices and financial market indicators for green economic recovery. We utilised 37 Asian markets' panel data from 1 January 2020, through 30 December 2020. The empirical findings demonstrate that the pandemic's emergence impeded monetary policy transmission, business practices, and financial markets. Our empirical contribution is to examine the size, sectoral allocation, and implementation options of three leading countries' (China, Japan, and Thailand) green recovery spending plans, which range significantly. However, this effect mainly affects the medium-and-long-term effects, and short-term spillover effects are primarily unaffected by Asian monetary policy uncertainty. Our findings have significant implications for green economic recovery among market players and regulators in the Asian market.

Keywords Financial markets · Business practices · Policy rates · Green economic recovery · Monetary policy

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1 Introduction

COVID-19 not only posed a severe risk to human health but also altered both productivity and livelihoods globally (Mohsin et al. 2022a). Countries have implemented lockdowns and other preventative measures as the number of officially identified cases continued to rise. These actions disrupted the world's supply systems and brought about a financial embargo. This resulted in stock markets crashing, energy markets collapsing, and a global economic slowdown (Bian and Yan 2022). One of the capital markets most affected by COVID-19 is the West Texas Intermediate (WTI) crude oil futures market. For the first time, on 21 March 2020 the WTI crude oil futures went from \$17 per barrel to –\$37 per barrel. This sharp decline in international crude oil prices sparked market panic. Coal futures, which are substitutes for one another, also declined in price, going from \$69.54 on 1 April to \$48.65 on 26 April. Since then, the market turmoil has continued (Si et al. 2021; Liu et al. 2022a, b). US authorities announced a fresh set of energy views to stabilise the financial market and lessen this catastrophe's effects. Specifically, it adopted a constantly continuing unrestricted credit expansion policy. However, since June, coal and the WTI crude oil costs have increased steadily. Additionally, concerns about how the energy market will change in the future have grown owing to high inflation (Ullah et al. 2020; Liu et al. 2022a, b).

The COVID-19 pandemic and the Federal Reserve's QE fiscal policies have affected the energy market. In other words, other market changes and the energy market's limitations impact its efficiency (Sun et al. 2019a, b; Lin 2022). It is also affected by the external environment, including epidemics and other severe occurrences. Owing to economic globalisation and financial liberalisation, energy market pricing effectiveness has a growing influence on business development and market activity. Additionally, it impacts the nation's economically and socially sustainable growth (Ikram et al. 2019) and trade commerce. Furthermore, the COVID-19 pandemic has remained active. Studying the linkages and risks in Asian energy markets, in addition to shifts in economic policy, energy infrastructure, and consumption (Abbas et al. 2022), is crucial at this time.

Since March 2020, nations have ramped up their fiscal policy efforts to mitigate the short-term effects of COVID-19 market volatility. Financing and assurances, particularly for SMEs, salary and unemployment incentives, tax cuts, and financial infusions to critical companies are only some of the many fiscal measures that have been implemented to bolster support for people and businesses. To keep financial markets operating and maintain the dissemination of monetary policy, financial institutions have swiftly reacted to the shock by lowering policy interest rates and providing currency injections. Motivating monetary authorities is the fear that price disruptions may severely harm key participants and set off a financial crisis (Mohsin et al. 2022b). Regulators have loosened profitability and capital restrictions on the use of cash reserves and availability to facilitate credit flow to businesses, consumers, and governments. To reduce unpredictability, several separate acts mutually benefit each other, generating a complex swarm of actions that are unparalleled. The role of financial interconnectedness

as a potential cause of price volatility and systemic risk was highlighted by the COVID-19 crisis (Iram et al. 2020). More importantly, this epidemic has highlighted the need to learn whether growth in connectedness increases the chance of a financial catastrophe. According to (Sun et al. 2019a, b) when a shock hits an economic sector or channel, the ripple effect may produce more instability across the market. It is specifically about the circumstances under which we might see the propagation of financial disruptions from one area or nation to another or from one channel or industry to another.

More importantly, when two indices generate a great deal of co-movement during quiet times, they maintain this relationship even after a shock arises in the market, even though the latter is not always attributable to financial contagion. According to other studies, a contagion occurs when the correlation between a crisis's home country and neighbouring countries sharply spreads from one market to another, with potentially disastrous consequences, as described by (Mohsin et al. 2021). In addition, Agyekum et al. (2021) investigate financial sector transmission, showing that when crises occur, the circumstances that generate movement in the indexes pull them collectively. However, Chang et al. (2022b) provide evidence for this as a significant increase in the correlation coefficients between volatility and equity market returns across countries.

This prompted further study of the interdependence of the current financial system. This effect on a system's vulnerabilities is also a subject of new research. Market diversity results from linkages in the network and thus, leads to a diverse risk distribution. However, Dilanchiev and Taktakishvili (2022) also contribute to the design of channels through which contagion may disperse shocks. This research contributes to the current literature on the network linkage connections by focusing on the channels of stock market indices within the greater context of the international financial industry. This was analysed considering the potential for widespread infection caused by the outbreak. This research does so by computing the cointegration test correlations between all possible sets of stock indices and by developing competitive economic networks according to these sets. When a new coronavirus is active, these linkages are used to identify areas where the spread of the virus is most likely to occur (Rahman and Dilanchiev 2021).

This study contributes to the existing literature by empirically investigating how changes in economic policy affected the level of global market uncertainty at the start of the COVID-19 pandemic. We examine the effect of announced authorised measures in financial regulatory, monetary, and fiscal policies on the volatility observed in Asian markets. Owing to the availability of high-quality data for a wide assortment of national equity markets, realised volatility is a frequently used proxy for asset-market-base uncertainty in the corporate finance literature. This is the first time a large sample has been utilised to represent precise data in a network of markets from the international financial system with joints of stock index correlations. This allowed us to see the COVID-19 period's structure of the world's financial networks. More precisely, we build financial networks of stock market indices and examine elements such as which nations have the most extraordinary linkages, which are more susceptible to passing uncertainties to stocks, and which are less susceptible to the most significant shocks during the pandemic.

The influence of an unconventional monetary policy on equity index returns and exchange rate changes is modest. It studies and contrasts the impacts of varied monetary policy coefficients on pandemic and non-pandemic days, business practices, and financial markets, and provides causes of interference between monetary policy and pandemics. The findings suggest that a pandemic has considerable influence on monetary policy transmission, business practices, and financial markets and that its severity only partially reduces transmission. Examine the effects of national trade liberalisation, financial development, industrialisation, fiscal policy, and other background variables. The findings reveal that the progression of the pandemic has had a substantial constraining influence on monetary policy transmission, including situational factors for green economic recovery. The less pronounced the influence of monetary policy on the profitability of 10 year government bonds, the more open the market is. Furthermore, monetary policy had a limited influence on financial markets during the outbreak. However, the epidemic's intensity restricted the ripple impact of monetary policy to a limited extent, and the ensuing outcomes were not yet sufficiently robust. In addition to showing the configuration and critical nodes of the networks under examination, this study also demonstrates their distinctive development. The sample we selected is quite vast, allowing us to examine how networks change over time and which nations become significant participants in international marketplaces. The lockdown schedule during the epidemic was the main focus of our investigation. This allowed us to claim that market forces may be explained by various factors, providing additional information to quantify and analyse the market's transmission. We also discuss regional differences in market responses to governmental policies based on stock market indices. The influence of China and Japanese authorities' activities on other markets from 1 January through 31 December 2020; panel data from 37 Asian economies; and the significance of particular initiatives, such as monetary stimulus, lending institutions, volatility enchantments, economic stimulus, and financial regulatory measures. Mainly, the price-based strategy has not been as successful as the quantitative monetary policy in dealing with most economic crises, and macroeconomic factors often have further significant short-term consequences on green economic recovery than long-term ones.

The remainder of this study is structured as follows. Section 2 summarises relevant in a literature review, and then, the data and its sources are summarised in Sect. 3. Results and discussion are presented in Sects. 4, and 5 concludes the study.

2 Literature reviews

2.1 COVID-19 impact on financial considerations

The transmission of monetary policy to articles has been studied extensively on how monetary policy is transmitted to business practices and financial markets, based on event research methodologies (Oliveira et al. 2020). Most studies have focused on government debt yields (Sun 2020), stock market index profitability (Ali et al. 2021; Guo et al. 2020), exchange rates (Im et al. 2020; Matkovskyy et al. 2020), and the spread of credit default swaps (Ali and Erenstein 2017; Anser et al. 2020; Chandio

et al. 2020; Ríos and Olaya 2018; Zhang et al. 2019). Instead of using a single indicator, other studies have utilised a combination of business practice indicators and their implementation (Singhania and Saini 2020).

Following the impact of COVID-19, we explored the consequences of the pandemic on business practices and financial markets. For example, describe how to disseminate pandemic information on business practices and financial markets, and assist academics in furthering their studies on pandemic impacts on financial markets (Osazefua and Imhanzenobe 2020; Prayoga and Siswanto 2021). In the future, the impact of COVID-19 (Kerr 2020) presents a comprehensive research program, as well as in the finance area. In addition, there is evidence of the pandemic's influence on financial markets (Samitas et al. 2022; Ozili and Arun 2020; Song and Zhou 2020). Many scholars have investigated the effect of COVID-19 on the stock markets of Asian nations, finding that during the impact of COVID-19, practically all economic sectors, particularly Indian financial markets, were in crisis. Condition. China and India are two of the most economical countries in the world (Goodell and Goutte 2020).

2.2 Impact of COVID-19 business practices and green recovery

The favourable impact of energy on economic growth may come at the expense of environmental damage if conventional fossil energy is near extinction. Although GRE is generally seen as a renewable resource that is favourable to the environment, there is still debate among academics about whether it contributes to economic growth (Chang et al. 2022a). However, other studies contend that the demand for renewable energy has no direct connection to economic growth. Similarly, Menyah and Wolde-Rufael argued that there is no causal relationship between economic growth and energy consumption under the neutral hypothesis. However, Assi et al. draw the opposite conclusion, stating that economic expansion may support the growth of the renewable energy sector, which in turn accelerates green recovery. There is a two-way relationship between economic growth and renewable energy, as found by several research (Nhuong and Quang 2022). In the short-and-term, Darling et al. (2022) posit that green economic recovery and economic development are causally related. Previous research has focused only on the correlation between gross domestic product (GDP) growth and generalised test scores. Financial difficulties are a common issue for small and medium-sized enterprises, and poor credit ratings are a significant barrier to R&D investment. Investors shy away from green initiatives in favour of those using fossil fuels because of the higher risks associated with the former small and medium-sized enterprises in the green economic growth sector would benefit from increased access to green financing (Ren et al. 2022), which will boost the affordability of renewable energy and decrease its price.

Using green finance, businesses and initiatives involved in generating renewable energy may be directed to receive funding, thereby optimising resource allocation (Ahmadian-Yazdi et al. 2022). However, developments in green economic recovery may increase business expenses and boost interest in environmentally friendly funding. To address environmental problems that emerge from a dearth of financial

resources, it is essential to have a green financial system that is both adaptable and sustainable. The adaptation of fossil resources to alternative renewables is believed to be facilitated by the expansion of the banking sector. According to (Maithya et al. 2022), the effect of green financing on GRE growth depends on the financial pricing mechanisms and national regulations associated with green finance. Against the backdrop of the post-epidemic and poor global economic development, the degree of business practices has emerged as a new driver of economic development (Diniz et al. 2022). It offers a window of opportunity to address pressing issues, such as diminishing resources and pollution, as well as quantitative and qualitative research investigating the correlation between business practices and green economic growth falls.

The second type focuses on the effects of digitisation on ecosystems. However, there is currently no widespread agreement among experts. Most academics believe that digitisation has a net beneficial effect on the natural world. By facilitating the development of a green-sharing infrastructure, digitisation encourages the green transformation of production and directs ecological sustainability (Taghizadeh-Hesary et al. 2021). The ecological burden caused by the fourth industrial revolution is growing. Therefore, there is a pressing need to publicise green buildings, green investments, and green practices so that they may prove an integral part of the solution to problems in both the commercial and natural worlds. According to Yoshino et al. (2021), “green finance” includes environmental safeguards and the advancement of the “green economy.”

In addition, recent policy proposals from Asian countries have indicated a quicker strategy for investing in renewable energy for long-term sustainability. For 17 nations in the G20 between 1970 and 2018, Taghizadeh-Hesary et al. (2019) examine the characteristics of green energy and economic activity from an environmental protection perspective. The results of this investigation corroborate the existence of a long-run equilibrium relationship between the analysed variables. In addition, renewable energy consumption’s significant role in financial transactions ultimately guarantees low carbon emissions and economic prosperity among the chosen member nations. Considering different energy regulations, Taghizadeh-Hesary et al. (2022b) studied how renewable energy is used in Kenya. The results, based on an advanced panel estimate, show that decentralisation positively impacts quality by reducing carbon emissions. Carbon emissions, environmental levies, technical development, and entrepreneurship, with particular emphasis on the Chinese economy. A surge in carbon emissions is attributed to regional development in China, which has led to substantial environmental problems that must be addressed while resolving panel data difficulties, such as cross-sectional dependency and slope heterogeneity. Economic prosperity before and after the covid-19 era was also considered by Yoshino et al. (2021). Their investigation of the connection between commodity costs and China’s economic expansion makes a significant contribution. During the COVID-19 period, natural resource prices were found to be susceptible to economic activity. Additional studies have focused on environmentally friendly practices and sustainable energy sources (Taghizadeh-Hesary et al. 2022a).

There is a gap in our understanding of the relevance of the green economy and sustainable practices across regions that have been noted in this research. This study

represents a current example of research that adds to the conversation by investigating the interactive relationship between the green economy and long-term sustainability. Huang et al. (2022) devised two main research topics to achieve this goal. The first focuses on sustainable economic development and its function of promoting firm-level employment from an environmental perspective. The study's key conclusions address the importance of ecological spillover on productivity and its underlying causality. Barriers to green economic growth and sustainable economic development have been noted by Yoshino et al. (2021) in terms of policy. These authors argue that governments worldwide share the dual ideals of a green economy and green growth enabled by renewable energy technology.

The present research on environmental sustainability in the shadow of SDGs has made a substantial contribution. Research on resource efficiency, green growth, degrowth, and Sustainable Development Goals (SDGs) has been the primary focus of research. It has been noted that the 17 SDGs created by the United Nations are intrinsically related to sustainable technology, the circular economy, and degrowth. Traditional economic models have a detrimental effect on the natural environment; therefore, Ahamd (2019) argues that green economic development techniques are essential. Their research focused on Asia's green economy, where the government has not yet made considerable progress. Simultaneously, the rising expense of green technology, the worsening danger of climate change, and unscrupulous practices pose severe challenges in promoting the development a green economy.

This study contributes to current knowledge in three ways. We examine the influence of COVID-19's impact on monetary policy transmission, business practices, and financial markets from a global perspective and the pandemic's global impact. Second, we need to further investigate the influence of epidemics on conventional and non-traditional political communication, and the severity and impact of outbreaks. Finally, these data help clarify how the influence of monetary policy transmission on business practices and financial markets changed in the aftermath of the pandemic, allowing for a more precise evaluation of future monetary policy changes. The term 'pandemic' is used to describe a situation in which a disease severely affects the financial market (Rahman and Velayutham 2020).

3 Modelling strategies

3.1 Theoretical background

Scholars believe that green economic growth is vital for sustainable development, because it strikes a balance between resource restrictions and economic expansion. Renewable sources have both beneficial and negative effects on green economic growth. First, substantial environmental problems arise from the direct use of resources such as oil and coal. These emissions are a significant source of environmental issues and have a devastating effect on environmentally responsible economic growth (Mohsin et al. 2018). Second, there is the potential for substantial ecological harm during the extraction of resources such as coal or minerals. Excessive mining operations destroy flora on the ground, and the sulphur components of

coal leach into water supplies, contributing to environmental problems such as environmental pollution and soil acidification. Finally, having an abundance of resources means that a region does not have to deal with the problem of resource limitations and that there are fewer incentives for local governments and firms to improve the efficiency with which they use resources. This, in turn, causes sources of energy areas to have considerably higher CO₂ emission intensities than resource-poor ones (Qiao et al. 2022).

Over the last 30 years, a vast body of work has shed light on the causes of labour force participation and the efficacy of various monetary and fiscal strategies in combating it. Pan et al. (2021) investigate optimum stabilisation measures, focusing on the suitability of monetary policy, while Braff et al. (2016) provide a detailed examination of the theories that predominated before the banking collapse. In particular, Mankiw and Weinzierl offer four countermeasures to mitigate the effects of a severe shock to accelerate economic growth, such as the one caused by the bursting of the housing bubble in 2007 and the subsequent economic collapse of Lehman Brothers, which wreaked havoc on the global financial system. The Federal funds rate should be lowered to zero if required. Second, longer-term interest rates should be lowered. Third, private spending should be increased by decreasing taxes. Fourth, if all else fails, government spending should be resorted.

Rockström et al. (2017) provide further theoretical support for our current model. These authors propose a dynamic econometric technique that demonstrates how the mechanics of financial difficulty are communicated to economic growth, resulting in a decrease in production and an increase in unemployment, in the context of the financial instability hypothesis by Höhne et al. (2017). Our sample includes the International Financial Crisis, which this model explains effectively. However, it does not deal with QE difficulties. It is easy to see how proponents of this model may claim that fixing the financial sector helps the economy, leading to increased production and lower green economic growth.

$$\Delta(U_{1,t}) = \alpha_{0,s_t} + \alpha_{1,s_t}(\Delta FA_{t-1}) + \beta_{1,s_t}(\Delta TY_{t-1}) + \beta_{2,s_t}\Delta(U_{1,t-1}) + \beta_{3,s_t}\Delta(U_{1,t-2}) + \varepsilon_{1,s_t} \quad (1)$$

$$P = \begin{pmatrix} P_{11} & P_{12} \\ P_{21} & P_{22} \end{pmatrix} \quad \text{with} \quad \sum_{s=1}^2 P_{sj} = 1, \quad \text{and} \quad P_{sj} \geq 0 \quad \text{for} \quad s, j = 1, 2. \quad (2)$$

Employment growth is only reported once per month, but Total Fed Assets and the 10-Year Treasury Note are reported once weekly and once daily, respectively. The time frame covered in this research extends from 2003 to 2015. We test the model to identify whether green economic growth is sensitive to changes in monetary policy proxy variables. This means that we must treat each dependent variable separately. We also acknowledge that the study period experienced periods of heightened volatility. Considering these considerations, we describe each dependent job indicator as a function of monetary predictor variables, with the underlying uncertainty in the economy being driven by an unobserved and potentially changing variable. The regime-switching regressions in (1) allow us to test our hypotheses,

assuming that there are only two regimes and that the transitions between them follow a Markov chain with constant transition probabilities over time.

3.2 Data and variables

Panel data from significant stock indices were collected from the sample nation chosen from the Asian regions under investigation from 1 January 2020 to 30 December 2020. The intensity of the epidemic and its impact on the global economy were considered in the chosen sample countries. COVID-19 has caused major pandemics in the 37 Asian countries surveyed. As of 30 April, 2020, there were over 10,000 confirmed cases. Our primary goal is to look for evidence of spillover and contagion in stock indices inside a financial network built on correlations. We looked for evidence of co-movements and contagion in the data obtained during the lockdown period. Table 1 shows the countries and the descriptive statistics used in this study. The countries were selected based on available data and GDP size.

We used a dummy variable 0–1 to evaluate the presence of the impact of COVID-19. Another factor to consider is the pandemic's severity (Li et al. 2020; Zhang et al. 2021). This is the proportion of confirmed cases in the overall population for green economic recovery.

A fictional variable based on an unorthodox monetary policy pronoun was produced as a variable. On the advertising date, the dummy variable was set to 1. Research on unconventional monetary policy is centred on a pandemic time (He et al. 2020; Topcu and Gulal 2020; Ashraf 2020). Following the start of the COVID-19 pandemic, monetary policy changed more frequently after 30 April 2010. Indicators that reflect daily events, business practices, and financial markets are chosen. These indicators can be affected by monetary policy and are flexible in responding to changes in monetary policy. We consider interest rates on 10-year zero-coupon government bonds to determine whether monetary policy is transmitted to the yield

Table 1 Explanatory variables and explained variables are described

Variable name	Symbol	Definition
Volatility spillovers	Y	Directional volatility spillovers in each country
Growth in confirmed cases	X_1	Daily growth in COVID-19 confirmed cases in each country
Fiscal policy	X_2	A breakdown of the three components of above-the-line metrics (i.e. increased expenditure and foregone income) as a percentage of GDP as of July 13, October 1, and November 25, 2020
Growth in cured cases	X_3	Daily growth in COVID-19 cured cases in each country
Green economic growth (Green total factor productivity)	Z_1	World Development Indicators (WDI) of World Bank
Energy input	Z_2	Total energy consumption
Marketization	Z_3	Market index

curve. Stock index returns should be included when evaluating monetary policy transmissions in the stock market (Okorie and Lin 2020).

Furthermore, the data contain changes in national exchange rates versus the US dollar, allowing for estimates of monetary policy transmission to the foreign currency market. Finally, to reflect the credit market, we evaluate the increased rate of credit default swap (CDS) spreads. CDS providers protect customers against default risk by CDS providers. In exchange, purchasers of CDS pay a fee known as the CDS spread. As a result, CDS spreads are employed as a direct replacement for economic credit risk business practices (Baek et al. 2020).

The authors manually gathered advertising data from central bank websites and different monetary policy publications and used DataStream to extract important data on daily interest rates. The US dollar index represents the US dollar exchange rate, but exchange rates of other currencies are determined by the current value of each currency versus the US dollar. Data from Johns Hopkins University were used to calculate the number of COVID-19 cases discovered daily.

3.3 The transmission of monetary policy to business practices and financial markets

We attempted to determine how the impact of COVID-19 affects business practices. The influence of monetary policy on four variables, business practices and financial markets was first estimated in this study (Khan et al. 2020). It employed literature to track business practices, financial markets, and key interest rates (conventional monetary policy) with a map of variables.

$$y_{i,t} = c + 1ri, t + It \quad (3)$$

$$y_{i,t} = c + 1ri, t + 2ui, t + I2y_{i,t} = c + 1ri, t + I2y_{i,t} = c + 1ri, t + I \quad (4)$$

The dummy variables u_i and t are set to 1 on the day the ad is published in an unconventional monetary policy, and 0 for the rest. Model (2), however, exclusively links t between 22 January 2022 and 30 April 2020 impact of the COVID-19. The least-squares approach was used. The estimation results for Models (1) and (2) are presented in Tables 2 and 3, respectively.

4 Results and discussion

4.1 Summary statistics

Table 2 provides the descriptive data for essential variables, such as innovation status, policy issues, financial intermediaries, and essential company characteristics. The average amount of investment in innovation is about 0.022, and the percentage of enterprises engaged in creation is around 43.6%. Energy-efficient businesses are more innovative, according to the differences across groups.

Table 2 Summary statistics

Variable	(1) Obs.	(2) Mean	(3) Std. Dev.	(4) Min.	(5) Max.	(6) Control	(7) Treat	(8) Diff.
Y	22,782	0.045	0.099	-0.500	0.346	0.054	0.041	0.013***
X_1	22,359	2.508	2.553	0.317	16.469	2.489	2.516	-0.028
X_2	22,363	0.815	0.175	0.262	1.000	0.793	0.825	-0.032***
X_3	42,498	0.027	0.047	-0.179	0.182	0.035	0.023	0.012***
Z_1	38,548	0.508	0.821	-0.921	3.299	0.466	0.526	-0.060***
Z_2	22,770	2.406	2.420	0.544	48.330	2.193	2.499	-0.306***
Z_3	42,498	22.379	1.469	19.713	27.367	22.347	22.392	-0.045***
Y	25,533	2.130	0.904	0.000	3.401	2.223	2.089	0.135***

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, while the symbols */**/** denote significance at the 95 per cent, 95 per cent, and 90 per cent confidence levels, respectively

Table 3 Business Practices and Financial Markets and Monetary Policy

	[1] Y	[2] X_1	[3] X_2	[4] X_3
$r_{i,t}$	0.021 (0.609)	-0.003 (-0.845)	-0.000 (-0.130)	0.006 (0.818)
$u_{i,t}$	0.055 (0.677)	-0.033*** (-2.790)	-0.007*** (-3.335)	0.011 (0.657)
C	-0.043 (-1.123)	-0.001 (-0.323)	0.000 (0.000)	0.008 (0.909)
R^2	0.0210	0.0613	0.0781	0.0512
Obs.	136	136	136	136
Number of countries	37	37	37	37

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The findings of the model benchmark regression are summarised in this table (2). Changes in $ad(u_i, t)$ of (political rate=key 5) (ri, t) and (keyword 333) will have a 10-year impact on the government bonus. GOV (yield), STO (stock index yield), EXC (exchange rate fluctuation), and CDS spread growth rate (CDS). Based on a sample from period H Impact of COVID-19, this estimate was made. From January 22 through April 30, 2020. Using the OLS technique, calculate the coefficients. The parentheses show the t-statistic, while the symbols */**/** denote significance at the 95 per cent, 95 per cent, and 90 per cent confidence levels, respectively

Furthermore, this method benefits 70.5% of Asia's publicly traded enterprises. Again, there are considerable disparities between the KZ and SA indices for enterprises with financial restrictions, particularly for low-energy companies with fewer financial restraints. The corporate return on assets and return on equity (ROE) are roughly 2.2 and 4.5%, respectively. Low-energy enterprises' financial metrics (hedging, liquidity, cash flow, and so on) are comparatively high, with averages of 2.508, 0.815, and 0.027. Furthermore, the total sales growth rate is 50.8%, and Tobin's Q is approximately 2,406.

4.2 Asian countries' economic recovery

Estimation factor 1 is statistically significant in all equations because it represents the reaction of business practices (Lee et al. 2020). The 10 year government bond yield coefficient of variation is positive when the reference rate changes and the transmission of conventional monetary policy is relatively modest. The curves are smooth and consistent with the findings of most investigations. Bond yield responses to target interest rates have a considerable beneficial influence on bond yields. Government bond rates and significant Chinese interest rates are highly correlated. Our findings are more ubiquitous and encompass various nations than those in earlier research.

The 2020 pandemic shocks affected local and regional economies worldwide, and further outbreaks in 2021 will considerably hinder global economic recovery. In particular, the regional GDP in 2021 will remain much lower than in the Bangladesh scenario, with a counterfactual decline of 0.5% (China) to 13.1%. (India). According to this study, global GDP will fall by 8.0% in 2021 compared to Thailand but will grow by 1.6% in 2020. The economic impact of the pandemic on countries worldwide will diminish energy demand, with Japan, South Asia, and the Philippines all seeing significant drops. Consumer demand for energy will continue to be lower than in China as the pandemic repeats in 2021. Total global energy consumption will decrease by 5.5%, ranging from 4.63% (ROW) to 12.1% in India, except in China, which will increase by 0.69% (Sharif et al. 2020). However, the rise in the non-fossil energy supply may be linked to the near-zero marginal cost of renewable power generation; regrettably, the CGE model cannot detect whether this effect is present.

Changes in benchmark interest rates positively and significantly impact the equity index results. However, a recent study demonstrates that when bond yields and interest rates climb, the stock index returns. The relationship between 10 year government bond interest rates and ROE in the Asian economy sample. This positive indicator indicates that macroeconomic variables, such as inflation expectations and economic predictions, impact both higher interest rates (or market interest rates) and the stock market index. For instance, a decrease in interest rates suggests a loose monetary policy that investors predict would result in inflation. Investors' inflation predictions drive commodity prices upward, resulting in higher borrowing costs and reduced company earnings. Therefore, both the asset's short-term value and the return on investment dropped.

Changes in (typical monetary policy) substantially influenced four samples of business practices and financial markets, as illustrated in Table 3. This implies that when governments change monetary policy in response to economic aims, such as production and inflation, or deploy political stimuli, they must consider these crucial monetary policy consequences. The money and financial markets are a subset of the money market. In Wahid et al. (2020), none of the four economic indicators have any bearing. This is a leading sign that the virus has hindered business practices.

In Chai et al. (2019), seminal work offers a helpful framework for integration. Direct measures, those dependent on global equality requirements, such as the legislation of one price or exchange rate requirements, are proposed as one tier of a

three-tiered categorisation system. The first is a straightforward indicator of whether returns on equivalent assets vary between countries. Almost all published research on infectious diseases has focused on this particular method. However, it may be difficult to find assets with similar risk profiles for fair assessment of financial market equalisation. The second method appeals to international capital market completion, whereas the third analyses local and foreign capital financing.

If the predicted discount rates in several markets are the same at a given juncture, the markets are considered to be incorporated. S.V and Sahu (2021) used this strategy to examine the interconnectedness of stock markets in ten developing and established Asian economies from 2005 to May 2013. According to research conducted on Asian financial markets in China, India, Sri Lanka, Vietnam, Bangladesh, and Pakistan, the level of integration is highest in Japan and Thailand’s developed financial sectors and lowest in Kuala Lumpur, Singapore, and Malaysia’s emerging financial sectors. The findings also indicate that the degree of financial integration in developing Asian countries is lower than in established markets. With the increasing importance of developing nations in the global economic system, it is crucial to include emerging economies in any assessment of data-transfer mechanisms (Yildirim et al. 2014). Market efficiency throughout the four epidemic phases was compared to market efficiency before the outbreak. After the outbreak, economic recovery grew rapidly, leading to a significant drop in market efficiency.

The efficiency of the WTI and coal markets fell by 86% and 16%, respectively, as shown in Table 4, where the h-index for the former was 0.7545 and the latter was 0.5214. Nonetheless, the decrease in the coal market is less severe. For the WTI crude oil futures market, the Hurst exponent was 0.3021. Thus, the current state of the WTI crude oil market is persistent. Regarding price changes in the WTI market,

Table 4 COVID-19 pandemic on Business practices and financial markets Monetary policy communication: overall sample duration

	[1]	[2]	[3]	[4]
Dependent variables	Y	X_1	X_2	X_3
$r_{i,t}$	0.462*** (58.941)	0.031*** (10.564)	-0.026*** (-24.709)	0.073*** (41.725)
$dum_{i,t}$	-0.011 (-0.252)	0.004 (0.238)	-0.003 (-0.562)	0.010 (1.032)
$dum_{i,t} \times r_{i,t}$	-0.414*** (-6.803)	-0.030 (-1.301)	0.023*** (2.781)	-0.070*** (-5.125)
c	0.007 (1.026)	-0.001 (-0.455)	0.001 (1.260)	0.002 (0.100)
Obs	4868	4895	4895	4893
R^2	0.419	0.022	0.112	0.262
Number of countries	37	37	37	37

This table displays the model’s regression findings (3). This is the H. (Political interest rate=key 5) (ri, t) variable, as well as its evolution (dumi, t) and interaction term (dumi, t ri, t) 4 affects (financial market=key) 4) variable. OLS technology is used to calculate coefficient estimations. The t-statistics are presented in parenthesis, with ***, **, and * indicating significance at 95%, 95%, and 90% confidence levels

modest swings tend to be long-lasting and memorable, whereas big swings tend to be antipersistent and exhibit mean-reversion behaviour. The market is affected by external influences if significant price changes occur. This demonstrates that external variables, such as the pandemic scenario and monetary and fiscal policies, significantly impact the WTI crude oil contract market during stage I. It is also noted that the Hurst exponent of the coal market was 0.7454. This market has a high degree of longevity.

Moreover, every HQ value was greater than 0.5. This demonstrates the extended durability and recall of coal price movements of all sizes. In conclusion, compared to the WTI crude oil market, the coal business is far less affected by external factors, such as the pandemic in stage I. At this point, the coal market is marginally more efficient than the WTI crude oil market is. However, the 0.4875 exponent of the cross-correlation between international economies is greater than 0.5. This demonstrates that the interactive market for crude oil futures and coal derivatives is seeing a “synchronisation” trend.

The number of new cases per day has increased steadily since the epidemic entered its second phase. However, the outbreak intensity did not cause a further drop in the performance of the two marketplaces. The coal h decreased to 0.5032, while the WTI crude oil h decreased to 0.6748. The interactive market h also decreased from 0.5021 to 0.5832, indicating increased efficiency. Both markets have HQ values larger than 0.5 when q is less than zero. From this, we learn that modest price changes in these two unrelated marketplaces have a lasting effect and memory of their own. The exponent of the cross-correlation was 0.4055. Hence, it is negative. This also demonstrates that WTI crude oil and coal markets are developing in different directions. The WTI crude oil futures market has a Hurst index ($h(q=2)$) of 0.5308, indicating a long-lasting strength. The pattern established in this step is carried out in the next step. The Hurst index of the coal market is 0.3720, suggesting that it is antipersistent. This implies that the subsequent growth pattern is distinct from this stage.

The effectiveness of free and coordinated markets has steadily increased in recent years. There was a 35.67% improvement in efficient markets as h of the WTI market fell from 0.7245 to 0.5245. The coal market dropped from 0.5232 to 0.6254, resulting in an 8.63% boost in the efficient market hypothesis. The effectiveness of the interactive market has increased by 38.64%. Both the Hurst exponent ($h(q=2)$) and the cross-correlation exponent ($r > 0.5$) in this market. Trends and traits that remain throughout time may be observed across the board in the market. However, when the markets reached stage IV, efficiency began to diminish. As the value of the interactive market is only 0.4953, the two economies do not develop in lockstep as shown in Table 4. In addition, the WTI crude oil market has an antipersistent $h(q=2)$ of 0.4877. The coal market has an $h(q=2)$ value of 0.4857 and is characterised by lengthy persistence.

As can be observed from Table 4, the four time periods have their own unique WTI and coal market development states. However, following the pandemic, the efficiency of markets plummeted, whether isolated or interconnected. Market efficiency in stages two and three did not decrease but increased as the disease spread steadily throughout Asia. The efficiency of the WTI crude oil market

increased by 37.68% during stage III. There was a 9.54% improvement in the perfect coal competition. According to some estimates, the effectiveness of interactive business has risen by as much as 40.47%. Once the market reached stage IV, efficiency quickly deteriorated. Reductions of 36.47, 40.14, and 52.63% were recorded.

Furthermore, the value of $h(q=2)$ may characterise the recent trends of the electricity market in the near term, as the persistent market characteristics in the first three stages are compatible with the actual emerging trends. Notably, the risk of the participatory marketplace is greater than that of the stock market and lower than that of the established market when analysing the WTI crude oil and coal markets separately and together. This provides unequivocal evidence of transitivity and spillover effects between the two economies. Non-traditional monetary policy has a somewhat larger influence on business practices and financial markets than conventional monetary policy.

Fiscal policy indicates that more integration across financial markets may have the following effects, one of which is a reduction in the advantages of diversification: First, national economies will be healthier if capital markets abroad are more developed, and second, people's propensity to save money will shift as a result. The former has a guaranteed beneficial effect on a nation's economic development, whereas the latter is contingent upon the ebb and flow of individual savers' decisions. For starters, households may reorganise their spending to put more money into the stock market rather than their usual consumption if the stock market becomes a more appealing investment option. Second, lowering regulatory hurdles would lead to a more significant mobilisation of funds, as businesses and individuals seek more lucrative investment opportunities in other markets.

4.3 The role of economic circumstances

The presence and intensity of COVID-19 had little influence on the preceding section. This portion validates the findings of the initial survey and the soundness of economic characteristics, which may explain why the influence of pandemics on monetary policy transmission has diminished. It employs the link between domestic credit and GDP as an indication of financial growth, according to (Xiuzhen et al. 2022; Wu et al. 2022). The degree of industrialisation is measured by the ratio of industrial added value to the GDP. Fiscal policy level is represented by the quantity of fiscal incentives for GDP in 2019 impact of COVID-19 in. Obtain a model based on the available literature.

Thus, the negative impact of the stock market on panic mood is reduced. Furthermore, the growth of cured instances is risky for investors. Consequently, people frequently undervalue projected positive impacts. As a result, as the number of COVID-19 cured cases increases daily, it will effectively restore investors' confidence in the positive sentiment and strengthen the favourable impact on global stock markets.

4.4 Robustness analysis

In this section, we identify alternate start dates for the crisis to conduct a further spillover analysis to confirm the robustness of our conclusions. To avoid redundancy, we only show the results for the alternate start date of 26 February 2020. The other results obtained with other potential start dates are nearly identical to the results in this section. Table 5 shows the role of economic circumstances.

When the rate of return on government debt and the exchange rate are the dependent variables, Table 5 presents the results of estimating the model (5). The findings of the estimation using the CDS difference as a dependent variable are summarised in Table 5. The other three environmental factors, except for commercial opening, had no substantial impact on the outcomes.

5 Conclusions and policy implications

The influence of the COVID-19 pandemic on monetary policy transmission, business practices, and financial markets was explored using a sample of 37 Asian nations afflicted by a large epidemic. This study examines the transmission of the monetary policy impact of COVID-19 on financial market business practices and financial markets, and transmission intensity. Our findings demonstrate that the spread of the pandemic inhibited monetary policy transmission between business practices and financial markets. The results remained consistent even when contextual factors were considered. However, as the pandemic worsens, the efficacy of monetary policy transmission (financial markets=4) remains unaffected. As a

Table 5 Role of economic circumstances: Impact of COVID-19 period

	EXC	EXC	EXC	EXC
$r_{i,t}$	0.001 (0.377)	-0.000 (-0.092)	-0.001 (-0.473)	0.000 (0.302)
$u_{i,t}$	-0.005* (-1.798)	-0.005* (-1.871)	-0.006 (-1.244)	-0.006** (-2.053)
$s_{i,t}$	-0.001 (-0.414)	-0.001 (-0.173)	-0.003 (-0.645)	-0.001 (-0.347)
$s_{i,t} \times u_{i,t}$	-0.047 (-1.626)	-0.040 (-1.325)	-0.081* (-1.649)	0.079 (0.782)
$X_{i,t}^1$	-0.002 (-1.306)			
$X_{i,t}^1 \times s_{i,t} \times u_{i,t}$	-0.101 (-1.242)			
$X_{i,t}^2$		-0.000 (-0.195)		
$X_{i,t}^2 \times s_{i,t} \times u_{i,t}$		-0.124 (-1.489)		
$X_{i,t}^3$			-0.000 (-0.208)	
$X_{i,t}^3 \times s_{i,t} \times u_{i,t}$			0.054 (0.463)	
$X_{i,t}^4$				-0.000 (-0.920)
$X_{i,t}^4 \times s_{i,t} \times u_{i,t}$				-0.015 (-1.488)
c	-0.000 (-0.491)	-0.000 (-0.122)	-0.001 (-0.654)	0.001 (0.558)
R^2	0.160	0.151	0.134	0.161
Obs.	111	111	111	111
Number of countries	12	12	12	12

***, **, and * indicating significance at 95%, 95%, and 90% confidence levels

result, during the COVID-19 pandemic (key 1), non-traditional monetary policy, on the other hand, is more effective than traditional monetary policy since it may influence the foreign currency market. This might suggest that the economy, business practices, and financial markets are more interested in international commerce, less impacted by the domestic economy, and more open to trade. If a country's trade openness is strong, the country's outbreak (COVID-19 outbreak=key 1) will have less influence on the overall economy for green economic recovery. However, the impact of (key interest rate=key 5) on the performance of government bonds remains unchanged.

Furthermore, the context variable regression findings reveal that the pandemic's weakening effect on monetary policy transmission is unaffected by the degree of industrialisation and financial development. Even though industrialisation and economic development rose in 2019, the manufacturing industry remained baffled by the coronavirus pandemic, and credit demand fell. The different repercussions of the crises are not visible. Pandemic of currencies. Political communication is facilitated by various levels of industrialisation and financial growth for green economic recovery.

On the other hand, greater trade openness may mitigate some of the detrimental effects of pandemics on monetary policy. The less open commerce there is, the less influence the domestic pandemic has on the economy. Furthermore, fiscal policies implemented during the pandemic have directly influenced currency rates and markets.

5.1 Policy implications

As a precaution against the consequences of monetary and fiscal policy discoveries before and after the pandemic, the government should push for more comprehensive environmental, Social, and Governance standards from businesses. Here, they become a valuable tool for shielding company returns from the impact of policy pronouncements and broader crises. The following suggestions were made to policymakers based on the findings of this study:

To begin, it is essential for the nations involved in the Asian countries to take stock of where things now stand, establish realistic goals, and develop a workable index to track green economic performance and development. There have been some attempts to track factors such as energy consumption, pollution levels, and economic growth, but they do not seem to be sufficient. For real-time performance assessment, which will aid in identifying any inconsistencies in implementing local and international energy legislation, these measurements should be substituted with a more robust and time-worthy indication.

Second, policymakers must reconsider how they spend taxpayer money and instead direct more money to essential services. Recent years have witnessed increased public investment in R&D and education in Asian nations, although they still lag behind their counterparts in the developed world. As this research demonstrates that investing in education and R&D may promote environmentally friendly economic growth, authorities need to increase their financing for these areas. Human

resource mobilisation and technological innovation, both essential to the development of a green economy, will flourish as a result.

Third, this research demonstrates that nations have different levels of public spending on green economic development. Governments should not settle for a generic plan but rather develop a strategy tailored to their nation if they want to maximise their advantages. There must be a more significant commitment from the government to support the development of green energy technology by domestic businesses. The outcomes should rigorously regulate such financing. Without clearly defined checkpoints along the way, projects funded by public and national interest money are more likely to go off. Therefore, it would be beneficial for government budgetary organisations and the green energy industry to increase their communication levels to better understand one another's goals and expectations.

The government should invest in fundamental research conducted in collaboration with academics and private companies. Essentially, governments should continue investing in developing cutting-edge innovation until they are mature enough for commercial private sector commercialisation. Nonetheless, government spending on technical education will slow technological advancement in this sector, perhaps at the expense of future economic growth.

Fourth, green development objectives and the United Nations' SDGs cannot be achieved through public expenditure alone. Thus, governments must establish incentive programs to encourage green financing in the private sector. Owing to the high risk and poor return, the private sector is hesitant to invest in green energy public work projects. New green energy infrastructure seems to have knock-on consequences (Yoshino et al., 2019). One option for boosting the return on investment of these green initiatives is to refund some of the wealth tax caused by this spillover effect.

Fifth, government de-risking instruments such as a green credit guarantee plan may be implemented to lower the risk of private green financing across all Asian nations. Emissions of greenhouse gases may be reduced by switching from energy sources that produce more carbon dioxide to those that produce less. Strategies for technology preferences, consumption, behaviour, lifestyle, production-consumption infrastructure and networks, service supply, and societal and technical change are all examples of demand-side policies. Politicians have difficulty developing efficient strategies to shift energy demand towards less use and more renewable power sources. The ideal market regions and target groups for such programs are comprehensive. Ideally, such strategies should be robust, low cost, adaptable, appropriate, fair, and have minimal unintended consequences, such as improved unintended allocation or performance. Simultaneously, if energy providers are engaged, these instruments should not be challenging to execute and should not unduly hinder market competition.

Finally, several global audits of renewable energy sources, including one by the International Energy Agency for 2020, imply that the green economy is being hit hard by the COVID-19 epidemic. However, by 2021, when the vaccine was initiated, the effect of COVID-19 on the uptake of renewable energy technology is projected to be negligible. Therefore, global green economic development should get back up as a result of stimulus packages and new economic recovery programs.

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Declarations

Conflict of interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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