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Repercussions of the Silicon Valley Bank collapse on global stock markets

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ABSTRACT

We employ an event study method to examine the impacts of the collapse of a prominent tech industry bank, Silicon Valley Bank (SVB), on global stock markets. The collapse triggered panic and uncertainty, leading to significant negative returns worldwide. The magnitude of the impact was more pronounced within developed markets due to the higher level of integration and interdependence with the global economy, where we find significantly high abnormal volatility. Further, the impact of the SVB collapse was not uniform across all countries, and those with robust banking system development and stability were impacted differently.

1. Introduction and background

The banking sector is a critical component of the global economy, and any significant bank failure can have far-reaching consequences (Cowan et al., 2022; Dorfleitner et al., 2017; Ozdemir et al., 2019). On March 10, 2023, the 16th largest bank[1] in the United States (US), Silicon Valley Bank (SVB), experienced a significant failure that resulted in the loss of billions of dollars in deposits and investments. The failure of SVB occurred against the backdrop of a growing tech industry during the COVID-19 pandemic, coinciding with the billions of dollars in clientele deposits. The bank's investments in US Treasuries and mortgage-backed securities,[2] coupled with the Federal Reserve's decision to increase interest rates to combat inflation, led to a sharp decline in the value of SVB's investments. This decline, in turn, led to a surge in withdrawals by the bank's clients, including startups that relied on private fundraising. The bank was forced to sell off assets,[3] including bonds that had lost value due to interest rate increases, resulting in significant losses of approximately $1.9 billion.[4] According to the Federal Deposit Insurance Corporation (FDIC), about 89 percent of the deposits of SVB were uninsured.[5] Further, Vo and Le (2023) document three attributes of SVB (in comparison to other large US banks) to explain its collapse: (1) lower equity investment, (2) higher debt investments, and (3) a highly concentrated depositor base.

Bank failures can significantly impact global stock markets, causing disruptions to the financial system and affecting investor confidence. Several studies have investigated the impact of bank failures on stock markets (Bellia et al., 2022; Fiordelisi and Ricci,

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[1] https://www.federalreserve.gov/releases/lbr/current/
[2] https://www.thehindubusinessline.com/on-campus/silicon-valley-bank-the-rise-and-fall/article66626897.ece
[3] https://www.tbsnews.net/thoughts/what-can-we-learn-svb-collapse-601474
[4] https://thefinancialexpress.com.bd/views/reviews/silicon-valley-banks-collapse-what-happened-and-why-it-matters
[5] https://www.firstpost.com/explainers/silicon-valley-bank-collapse-what-happens-to-customers-deposits-tech-start-up-fdic-12282302.html

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2016; Hori, 2005; Liu, 2020; Toussaint-Comeau et al., 2020; Yamori and Murakami, 1999). These studies suggest that bank failures can significantly negatively impact domestic and international stock markets, with the effect being more pronounced for small/community banks (Toussaint-Comeau et al., 2020) and during economic stress. The findings also suggest that factors such as the type of bank asset holdings influence the impact of bank failures on stock markets (Caiazzo and Zazzaro, 2023) and the strength of institutions in the country (Kabir and Hassan, 2005; Ramirez and Shively, 2012).

Given the global significance of the banking sector, we hypothesize that the SVB failure should trigger significant ramifications for the global stock markets (Cowan et al., 2022). This paper examines the global stock market reaction to the United States' most significant bank failure after 2008.[6] The study aims to provide insights into the potential contagion effects of a bank failure of this magnitude and to offer suggestions for different stakeholders to mitigate the risks of such failures in the future.

Furthermore, the existing research lacks studies explicitly focusing on bank failures' impact on global stock markets. Contemporary studies that investigate the effects of banking crises on domestic stock markets include Aharony and Swary, (1983), Bellia et al. (2022), Hori (2005), Kilic et al. (2000), and Liu (2020). By conducting an event study on this bank failure, we provide insights into the extent of the impact on the global stock markets (including the effects on stock prices and volatility) and the timing and magnitude of the effects. The findings provide practical implications for investors, policymakers, and financial institutions.

2. Data and methods

2.1. Data

We collect a list of 82 global stock indices (23 developed, 24 emerging, 21 frontier, and 14 standalone markets) from the Morgan Stanley Capital International (MSCI) website based on their market classification. However, the final sample considers only 53 indices (23 developed and 30 emerging and other markets). The list of sample indices is available in Appendix A1. We use the MSCI All Country World Index (ACWI) as the benchmark index. MSCI ACWI is a stock market index that tracks the performance of companies in both developed and emerging markets around the world. The MSCI ACWI is considered a benchmark index for global equity investments and provides investors with a comprehensive view of the global equity market (Angelidis and Tessaromatis, 2017; Boubaker et al., 2022; Mohanty et al., 2021). We present a timeline of significant events around the SVB collapse in Fig. 1.

2.2. Methods

The Brown and Warner (1985) event study method (ESM)[7][8] is applied to calculate the abnormal returns (*AR*) as in Eq. (1).

$$AR_{i,t} = LR_{i,t} - \left(\widehat{\alpha} + \widehat{\beta} LR_{MSCIACWI,t}\right) \tag{1}$$

where, $AR_{i,t}$ indicates the *AR* of the index *i* on day *t*; $LR_{i,t}$ indicates the actual log return (*LR*) of the index *i* on day *t*; $\widehat{\alpha}$ and $\widehat{\beta}$ are the estimators of the OLS regression model; and $LR_{MSCIACWI,t}$ indicates the *LR* on the benchmark index *MSCI ACWI* on day *t*.

The index-wise *ARs* are averaged across sample indices to calculate the average *AR* (*AAR*). The *AARs* are cumulated across the event days to calculate the cumulative *AAR* (*CAAR*).

$$CAR_{i,\ T1-T2} = \sum_{t=T1}^{T2} AR_{i,t} \tag{2}$$

$CAR_{i,\ \ T1\ -\ T2}$ indicates the cumulative *AR* (*CAR*) of index *i* during the event window (*T1–T2*). For the country-wise analysis, we use event windows of different lengths (viz., pre-event (*[-5,+1]* and *[-3,-1]*), event *[0,0]*, and post-event (*[+1,+3]* and *[+1,+5]*)).

Further, we run the cross-sectional regression to find if index-specific factors drive the *CARs*. In our regression model (see Eq. (3)), following prior studies (Bindu et al., 2022; Blau et al., 2016; Boubaker et al., 2022; Hassan and Bashir, 2005; Rahim et al., 2013), we use the *CARs* as a dependent variable, and *Dummy variable* (*DEV*) for developed nations, bank deposits to GDP (*BDGDP*), Z-Score (*ZS*), Gross Domestic Product (*GDP*), inflation (*INF*), past returns (*PSTR*), and past volatility (*VOLL*) as the independent variables.

$$CAR_{ij} = \alpha + \beta_1 DEV_{ij} + \beta_2 BDGDP_{ij} + \beta_3 ZS_{ij} + \beta_4 GDP_{ij} + \beta_5 INF_{ij} + \beta_6 PSTR_{ij} + \beta_7 VOLL_{ij} + \varepsilon_{ij} \tag{3}$$

where, CAR_{ij} is the *CAR* for index *i* for event window *j*. Other variables are defined in Appendix A2. Fig. 2 presents the empirical framework.

[6] https://www.forbes.com/sites/conormurray/2023/03/13/what-to-know-about-silicon-valley-banks-collapse-the-biggest-bank-failure-since-2008/?sh=7bcb9fa44c27

[7] Finance researchers have abundantly used the ESM to capture the immediate effect of events that significantly affect stock market returns (Boubaker et al., 2015; Goodell & Huynh, 2020; Jin et al., 2022; Kumari, Kumar, et al., 2023; Mansley et al., 2023; Nerlinger & Utz, 2022; Pandey et al., 2022; Pandey & Kumari, 2021; Rai & Pandey, 2021; Wang et al., 2022). We use a 210-day estimation window ranging from t_{-215} to t_{-6}, and an 11-day event window from t_{-5} to t_{+5} (i.e., the event window begins five trading days before the event date and continues till the next five days post-event date). The event date is 10 March 2023.

[8] In addition to the Brown and Warner (1985) parametric test, we also conducted an additional analysis using a non-parametric rank test proposed by Corrado (1989) to see if the results support those of the standard event study.

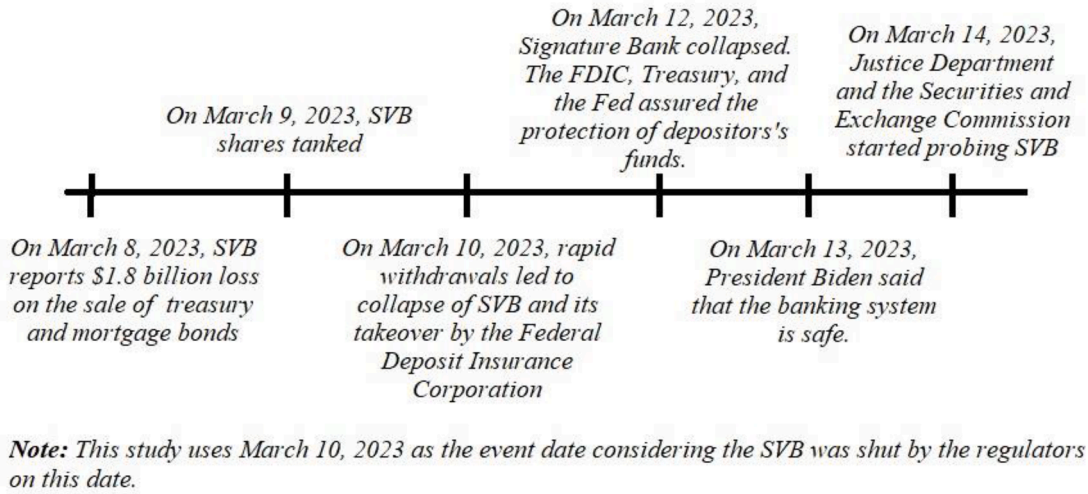

Fig. 1. Timeline of events.

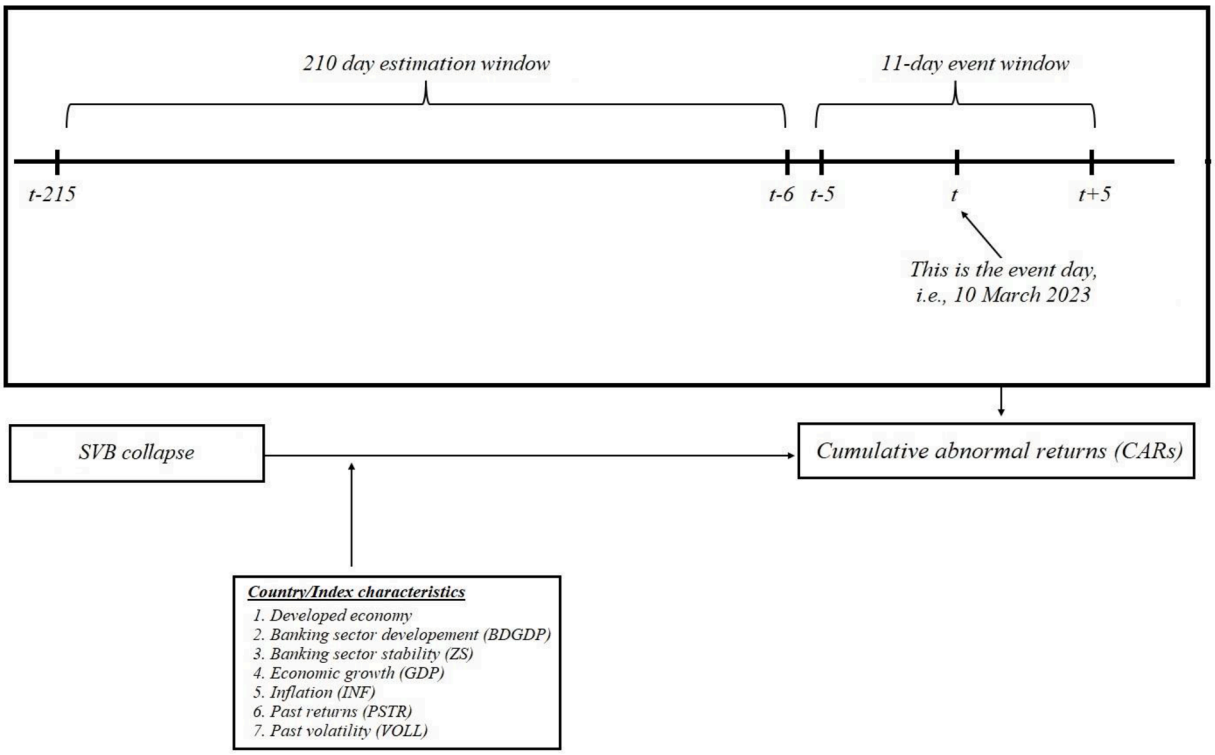

Fig. 2. Empirical framework.

2.3. Descriptive statistics

Appendix A3 presents the descriptive statistics of the dependent and independent variables. The pre-event period *CARs* seem equally distributed, with the absolute value of the maximum and minimum *CARs* almost equal. However, the event day and post-event *CARs* experience more negative returns (-4.17% on event day, -12.86% during *[+1,+3]*, and -10.56% during *[+1,+5]*), and the maximum *CARs* lie near 1% only. There exists variance among the country-specific independent variables.

Table 1
Average and cumulative average abnormal returns for the global stock markets.

Days	AAR	AAR_t	CAAR	$CAAR_t$
t-5	0.06	0.40	0.06	0.16
t-4	0.10	0.66	0.16	0.47
t-3	0.09	0.61	0.25	0.83
t-2	0.02	0.12	0.27	1.03
t-1	0.14	0.93	0.41*	1.92
t	-0.92***	-6.06	-0.51***	-3.34
$t+1$	-1.14***	-7.51	-1.65***	-7.67
$t+2$	-0.55***	-3.63	-2.21***	-8.36
$t+3$	-1.09***	-7.13	-3.29***	-10.80
$t+4$	-0.41***	-2.72	-3.71***	-10.88
$t+5$	-0.09	-0.56	-3.79***	-10.16

Notes: This table presents the average and cumulative average abnormal returns for the global sample. t-values are presented in parentheses. *, **, and *** indicate p-values less than 0.10, 0.05, and 0.01, respectively.

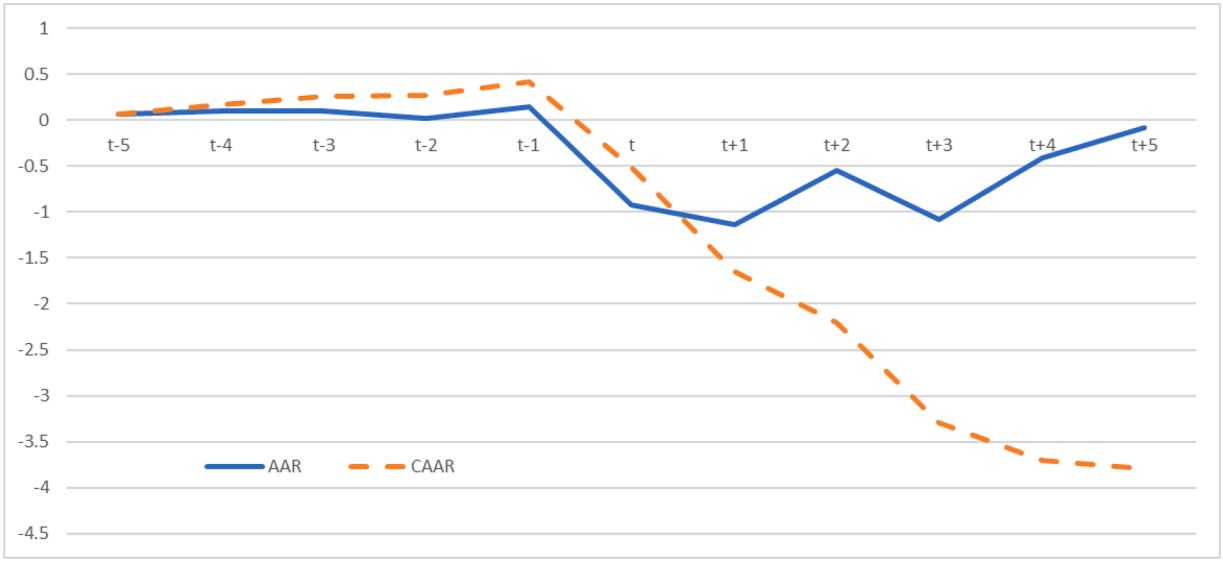

Fig. 3. AAR and CAAR during the event window.

3. Results and discussions

3.1. Impacts on global stock markets

Table 1, while presenting the *AARs* for the global indices during the 11-day event window, infers that the pre-event returns are insignificant, and from the event day onwards, the returns are significantly negative up until day $t+4$. It is pertinent to mention that despite the FDIC's announcement on 12 March 2023 (i.e., before $t+1$) to support the depositors,[9] the market remained unresponsive and plummeted, possibly because there was no bailout for the shareholders.[10] The cumulative *AARs* are significant and negative through days *t-1* to $t+5$, indicating the turmoil in the global stock markets. Prior studies reported a similar impact while investigating abnormal returns around significant events (Boubaker et al., 2022; Miyajima and Yafeh, 2007; Pandey and Kumari, 2021). Fig. 3 indicates that the global markets The panic and uncertainty triggered by the failure of such a significant bank (Aharony and Swary, 1983), particularly given its prominence in the tech industry, led to such unrest in the global stock markets. Moreover, investors' perception that the SVB collapse may have a domino effect on other banks and financial institutions led to further losses in the stock market. Additionally, the loss of billions of dollars in deposits and investments led to a contraction of credit and a slowdown in investment in the tech industry, which could have a ripple effect on the broader economy. Other significant events, including the Signature Bank collapse, Credit Suisse decline, and administrative interventions, added to the abnormal returns.

[9] https://www.fdic.gov/news/press-releases/2023/pr23016.html
[10] https://nypost.com/2023/03/14/silicon-valley-bank-crisis-clearly-a-bailout-ex-fdic-chairman-says/

Table 2
Average abnormal returns for different sample sizes.

Days	Global	Developed	Emerging	Americas	Europe	MEA	Asia-Pacific
t-5	0.06	0.04	0.03	0.39	-0.14	0.34	0.01
	(0.40)	(0.22)	(0.15)	(0.91)	(-0.66)	(0.95)	(0.04)
t-4	0.10	-0.01	0.12	0.11	-0.03	0.10	0.30
	(0.66)	(-0.06)	(0.54)	(0.26)	(-0.14)	(0.29)	(0.92)
t-3	0.09	0.27	-0.01	-0.48	0.11	0.02	0.44
	(0.61)	(1.43)	(-0.05)	(-1.11)	(0.49)	(0.07)	(1.38)
t-2	0.02	-0.08	0.11	0.78*	0.08	-0.06	-0.46
	(0.12)	(-0.42)	(0.49)	(1.80)	(0.38)	(-0.18)	(-1.43)
t-1	0.14	0.30	0.06	-0.60	0.22	0.50	0.22
	(0.93)	(1.61)	(0.26)	(-1.39)	(1.00)	(1.41)	(0.67)
T	-0.92***	-0.97***	-0.88***	-0.92**	-0.75***	-1.27***	-0.98***
	(-6.06)	(-5.13)	(-4.08)	(-2.13)	(-3.46)	(-3.56)	(-3.02)
$t+1$	-1.14***	-1.52***	-0.77***	-1.14***	-1.99***	-0.60*	-0.16
	(-7.51)	(-8.07)	(-3.55)	(-2.63)	(-9.24)	(-1.68)	(-0.50)
$t+2$	-0.55***	0.17	-0.99***	-0.70	0.31	-1.07***	-1.50***
	(-3.63)	(0.93)	(-4.56)	(-1.61)	(1.43)	(-2.99)	(-4.64)
$t+3$	-1.09***	-1.41***	-0.80***	-1.55***	-2.13***	-1.21***	0.91***
	(-7.13)	(-7.48)	(-3.69)	(-3.60)	(-9.88)	(-3.39)	(2.80)
$t+4$	-0.41***	-0.39**	-0.42*	0.30	-0.13	-0.82**	-1.01***
	(-2.72)	(-2.06)	(-1.95)	(0.70)	(-0.61)	(-2.30)	(-3.13)
$t+5$	-0.09	-0.45**	0.16	-0.56	-0.71***	0.05	1.08***
	(-0.56)	(-2.41)	(0.73)	(-1.30)	(-3.28)	(0.14)	(3.34)

Notes: This table presents the average abnormal returns for different samples. t-values are presented in parentheses. *, **, and *** indicate p-values less than 0.10, 0.05, and 0.01, respectively.

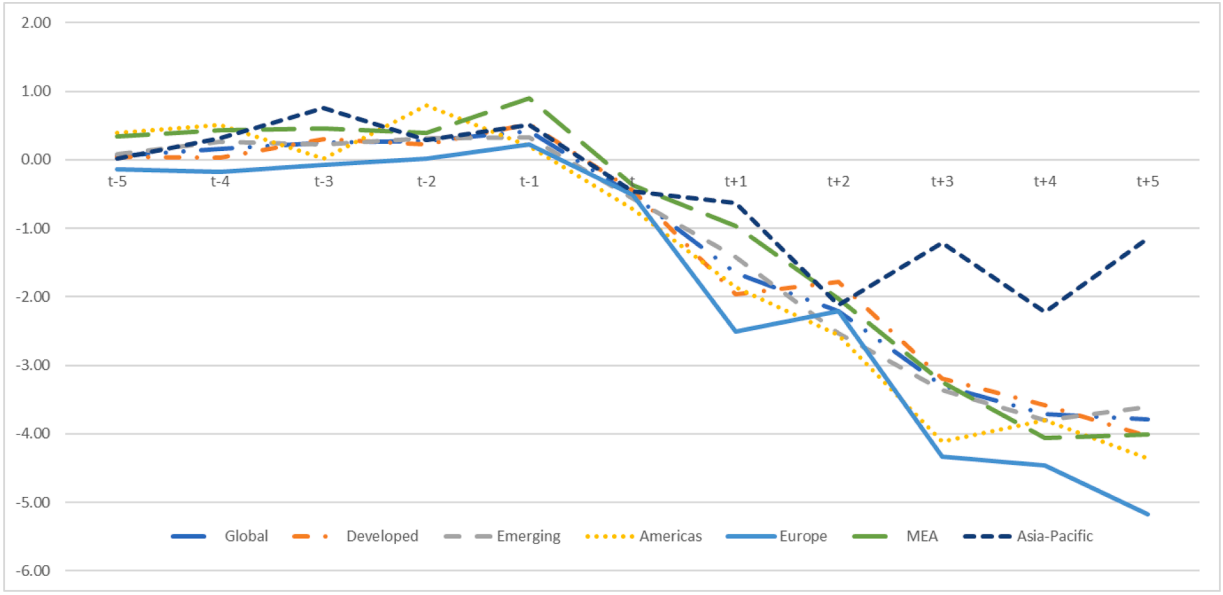

Fig. 4. The trend of CAARs for different markets during the event window.

3.2. Impacts on regional stock markets

Table 2 presents the *AARs* of different samples based on regional segregation. The *AARs* for the developed markets, while being significantly negative on all days since the event day except on $t+2$, ranged from 0.39 percent ($t+4$) to -1.52 percent ($t+1$). At the same time, the *AARs* for emerging markets, being significantly negative through event day to $t+4$, ranged from -0.42 percent ($t+4$) to -0.99 percent ($t+2$). Although both developed and emerging markets experienced negative returns, the magnitude of the impact was more on developed markets. This may be due to the higher level of integration and interdependence of developed markets with the global economy, making them more vulnerable to external shocks such as the SVB collapse. Moving forward, we find that while the *AARs* for the Americas markets were significantly negative on *t-2, t, t + 1*, and $t+3$, those for the European markets were also significantly negative on $t+5$. Concomitantly, the *AARs* for the Middle East and African (MEA) markets were significantly negative from the event day to $t+4$, and those for the Asian markets were significantly negative on the event day, $t+2$ and $t+4$ (but

Table 3
Country-wise cumulative abnormal returns for different event windows for developed markets.

Country	[-5,-1]	[-3,-1]	[0,0]	[+1,+3]	[+1,+5]
Australia	1.02	0.45	-1.98**	-0.89	-2.12
	(0.50)	(0.28)	(-2.15)	(-0.56)	(-1.03)
Austria	0.80	1.10	-0.70	-3.84**	-10.56***
	(0.36)	(0.63)	(-0.70)	(-2.20)	(-4.68)
Belgium	-0.19	0.03	-1.27*	-2.70**	-3.78**
	(-0.12)	(0.03)	(-1.77)	(-2.18)	(-2.36)
Canada	-0.44	-0.08	-0.60	-1.47*	-1.93*
	(-0.41)	(-0.1)	(-1.26)	(-1.78)	(-1.81)
Denmark	0.54	0.96	-1.18	-1.05	-2.47
	(0.21)	(0.48)	(-1.02)	(-0.52)	(-0.95)
Finland	-0.17	0.03	-0.93	-4.21***	-5.51***
	(-0.09)	(0.02)	(-1.13)	(-2.95)	(-2.99)
France	0.88	0.97	-0.45	-4.41***	-4.44***
	(0.53)	(0.76)	(-0.61)	(-3.44)	(-2.68)
Germany	2.60	1.84	-0.37	-4.15***	-4.52**
	(1.48)	(1.35)	(-0.47)	(-3.05)	(-2.57)
Hong Kong	-2.14	-2.26	-2.56	1.39	0.96
	(-0.52)	(-0.72)	(-1.41)	(0.44)	(0.24)
Ireland	1.63	1.13	-0.30	-4.49***	-4.93**
	(0.76)	(0.68)	(-0.31)	(-2.68)	(-2.28)
Israel	4.13	3.47	-2.68***	-0.37	-1.73
	(1.99)	(2.16)	(-2.89)	(-0.23)	(-0.84)
Italy	-0.44	0.35	-1.12	-4.81***	-5.40***
	(-0.29)	(0.29)	(-1.62)	(-4.03)	(-3.50)
Japan	4.27	2.11	-1.32	-3.12*	-2.95
	(1.79)	(1.14)	(-1.24)	(-1.69)	(-1.24)
Netherlands	0.39	1.15	-0.38	-3.17**	-2.95*
	(0.24)	(0.9)	(-0.51)	(-2.49)	(-1.79)
New Zealand	-0.26	-0.50	-0.71	-1.08	-0.60
	(-0.19)	(-0.48)	(-1.19)	(-1.05)	(-0.45)
Norway	-1.27	-0.79	-0.31	-5.45***	-6.17**
	(-0.48)	(-0.38)	(-0.26)	(-2.63)	(-2.31)
Portugal	1.08	1.33	0.02	-3.33**	-5.17**
	(0.54)	(0.85)	(0.02)	(-2.14)	(-2.57)
Singapore	-0.45	-0.42	-1.00	-0.02	0.25
	(-0.3)	(-0.36)	(-1.50)	(-0.02)	(0.17)
Spain	1.40	0.48	-0.78	-5.55***	-6.49***
	(0.81)	(0.36)	(-1.02)	(-4.18)	(-3.78)
Sweden	1.86	1.09	-1.49*	-4.08***	-5.11***
	(0.96)	(0.73)	(-1.74)	(-2.73)	(-2.66)
Switzerland	-1.31	-0.39	-1.03	-1.90	-1.27
	(-0.81)	(-0.31)	(-1.43)	(-1.52)	(-0.78)
United Kingdom	-0.50	0.45	-1.16	-5.13***	-5.60***
	(-0.31)	(0.36)	(-1.61)	(-4.12)	(-3.49)
United States	-1.38	-1.13	0.09	0.53	-0.16
	(-1.21)	(-1.28)	(0.18)	(0.60)	(-0.14)

Notes: This table presents the cumulative abnormal returns for developed markets. t-values are presented in parentheses. *, **, and *** indicate p-values less than 0.10, 0.05, and 0.01, respectively. [-5,-1], [-3,-1], [0,0], [+1,+3], and [+1,+5] indicate the pre-event, event, and post-event windows of different lengths.

significantly positive on $t + 3$ and $t + 5$) and insignificant on $t + 1$. These results further indicate that the event's impact was felt differently across different regions, with developed markets being more vulnerable in the short term but with adverse effects spreading to other regions over a longer time horizon. Fig. 4 is the graphical presentation of the *CAARs* for different markets, indicating that the cumulative returns of Asian markets stopped declining since $t + 2$. These findings highlight the importance of considering regional differences and interdependence when analyzing the effects of external shocks on global financial markets. These differences across different markets may be due to variations in market characteristics and economic fundamentals.

3.3. Country-wise heterogeneous impact

Table 3 presents the country-wise pre-and post-event *CARs* for the 23 developed markets. The event day abnormal returns are significant and negative only for Australia, Belgium, Israel, and Sweden. The post-event *CARs* are significant and negative for 14 developed markets, including Austria, Belgium, Canada, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, and the United Kingdom. While Japan's stock market returns were significant and negative only for *[+1,+3]*, the stock market indices of Denmark, Hong Kong, New Zealand, Singapore, Switzerland, and the US remained unimpacted by the SVB collapse. These results indicate that the impact of the SVB collapse was not uniform across all countries and that some countries were more

Table 4
Country-wise cumulative abnormal returns for different event windows for emerging markets.

Country	[-5,-1]	[-3,-1]	[0,0]	[+1,+3]	[+1,+5]
Brazil	2.14	1.45	-0.88	-0.60	-1.52
	(0.74)	(0.64)	(-0.68)	(-0.27)	(-0.52)
Chile	-0.91	-0.25	0.00	-3.68*	-5.02**
	(-0.36)	(-0.13)	(0.00)	(-1.89)	(-2.00)
China	-1.08	-1.19	-1.31	1.02	0.50
	(-0.48)	(-0.69)	(-1.31)	(0.59)	(0.22)
Colombia	1.88	-0.96	-1.28	-7.54***	-9.26***
	(0.55)	(-0.36)	(-0.84)	(-2.86)	(-2.72)
Czech Republic	-1.08	-1.03	-1.14	-4.67***	-4.53*
	(-0.46)	(-0.57)	(-1.10)	(-2.60)	(-1.95)
Egypt	-3.37	-2.50	-3.33**	-8.46***	-9.34***
	(-1.04)	(-0.99)	(-2.30)	(-3.37)	(-2.88)
Greece	-3.31	1.01	-2.04**	-2.99*	-4.01*
	(-1.56)	(0.62)	(-2.15)	(-1.82)	(-1.89)
Hungary	-3.18	-2.68	1.00	-5.55**	-4.41
	(-1.07)	(-1.16)	(0.75)	(-2.40)	(-1.48)
India	0.72	0.54	-0.83	-2.59*	-2.05
	(0.37)	(0.36)	(-0.96)	(-1.74)	(-1.07)
Indonesia	-0.53	0.48	-0.24	-1.84	-1.18
	(-0.30)	(0.35)	(-0.30)	(-1.33)	(-0.66)
Korea	0.19	-0.77	-0.55	-0.26	0.27
	(0.08)	(-0.41)	(-0.51)	(-0.14)	(0.11)
Malaysia	-0.05	0.35	-0.88	-1.82	-1.31
	(-0.03)	(0.28)	(-1.22)	(-1.46)	(-0.81)
Mexico	0.54	0.29	-0.60	-1.09	-1.78
	(0.29)	(0.2)	(-0.71)	(-0.75)	(-0.94)
Peru	-0.53	-0.04	0.06	-0.36	-0.69
	(-0.22)	(-0.02)	(0.06)	(-0.19)	(-0.29)
Philippines	0.02	-0.47	-0.08	-1.75	-1.78
	(0.01)	(-0.22)	(-0.06)	(-0.81)	(-0.64)
Poland	2.50	0.77	-0.93	-4.29**	-5.82**
	(0.98)	(0.39)	(-0.81)	(-2.17)	(-2.29)
Qatar	2.29	1.25	-1.33	-3.78**	-5.82**
	(0.96)	(0.68)	(-1.25)	(-2.05)	(-2.44)
Saudi Arabia	2.69	1.21	-0.42	-2.60	-1.60
	(1.12)	(0.65)	(-0.39)	(-1.40)	(-0.66)
South Africa	0.64	0.09	-0.93	-4.69**	-5.67**
	(0.25)	(0.05)	(-0.82)	(-2.36)	(-2.22)
Taiwan	0.60	-0.07	-1.54	0.37	1.16
	(0.15)	(-0.02)	(-0.88)	(0.12)	(0.29)
Thailand	-0.15	1.02	-0.62	-2.00*	-2.20*
	(-0.11)	(0.99)	(-1.04)	(-1.95)	(-1.67)
Turkey	2.01	0.98	-0.99	-5.83	-6.57
	(0.42)	(0.27)	(-0.46)	(-1.58)	(-1.38)
UAE	0.13	-0.93	-0.12	-2.99*	-1.77
	(0.06)	(-0.56)	(-0.12)	(-1.80)	(-0.83)
Kuwait	-0.63	0.06	-0.54	-2.13	-0.43
	(-0.34)	(0.04)	(-0.65)	(-1.49)	(-0.23)

Notes: This table presents the cumulative abnormal returns for emerging markets. t-values are presented in parentheses. *, **, and *** indicate p-values less than 0.10, 0.05, and 0.01, respectively. [-5,-1], [-3,-1], [0,0], [+1,+3], and [+1,+5] indicate the pre-event, event, and post-event windows of different lengths.

affected than others. These heterogeneities across nations may be attributable to country-specific factors (Boubaker et al., 2022). The results also suggest that a widespread negative sentiment towards the banking sector in many countries characterized the post-event period.

Table 4 presents the country-wise pre-and post-event *CARs* for the 24 emerging markets. The event day abnormal returns are significant and negative only for Egypt and Greece. The post-event *CARs* are significant and negative in only nine emerging markets, including Chile, Colombia, Czech Republic, Egypt, Greece, Poland, Qatar, South Africa, and Thailand. While the *CARs* for Hungary, India, and UAE are significantly negative for only *[+1,+3]*, the stock market indices of Brazil, China, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Saudi Arabia, Taiwan, Turkey, and Kuwait have been insignificant to the SVB collapse. These results indicate that the impact of the SVB collapse on emerging markets was not uniform, and some countries were more affected than others.

Table 5 presents the pre-and post-event *CARs* for the countries in frontier and standalone markets. The event day abnormal returns are significant and negative only for Argentina, Lithuania, and Jordan. The post-event *CARs* are significant and negative only for Argentina. Stock market indices in Pakistan, Oman, and Sri Lanka were insignificant to the event. We find a significant negative impact on the stock markets of Argentina, Lithuania, and Jordan, with Argentina experiencing a prolonged negative effect.

Table 5
Country-wise cumulative abnormal returns for different event windows for frontier and standalone markets.

Country	[-5,-1]	[-3,-1]	[0,0]	[+1,+3]	[+1,+5]
Pakistan	2.60	0.80	0.68	0.42	-0.85
	(1.15)	(0.46)	(0.68)	(0.24)	(-0.38)
Argentina	0.30	-1.71	-4.17**	-12.86***	-8.78*
	(0.06)	(-0.47)	(-2.00)	(-3.56)	(-1.88)
Lithuania	0.79	0.55	-0.83**	-0.62	-0.93
	(1.09)	(0.97)	(-2.53)	(-1.10)	(-1.28)
Jordan	1.96	1.32	-2.26*	-1.40	-6.30
	(0.67)	(0.58)	(-1.72)	(-0.61)	(-2.15)
Oman	0.29	0.19	0.21	0.56	-0.13
	(0.22)	(0.19)	(0.36)	(0.54)	(-0.09)
Sri Lanka	2.42	2.26	-0.81	-0.12	0.54
	(0.45)	(0.54)	(-0.34)	(-0.03)	(0.10)

Notes: This table presents the cumulative abnormal returns for frontier and standalone markets. t-values are presented in parentheses. *, **, and *** indicate p-values less than 0.10, 0.05, and 0.01, respectively. [-5,-1], [-3,-1], [0,0], [+1,+3], and [+1,+5] indicate the pre-event, event, and post-event windows of different lengths.

Table 6
Cross-sectional results.

Variables	[-5,-1]	[-3,-1]	[0,0]	[+1,+3]	[+1,+5]
DEV	0.847	0.630	0.347	-1.151**	-1.176
	(0.569)	(0.377)	(0.242)	(0.571)	(0.768)
BDGDP	-0.002	-0.004	-0.005***	0.0122*	0.0167**
	(0.007)	(0.005)	(0.001)	(0.007)	(0.008)
ZS	0.036	0.004	-0.026**	0.068***	0.015
	(0.030)	(0.022)	(0.013)	(0.024)	(0.038)
GDP	0.000	-0.000	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.051)
INF	0.060	-0.018	0.010	0.012	0.028
	(0.049)	(0.035)	(0.023)	(0.061)	(0.051)
PSTR	-9.820*	0.923	-2.302	-8.761	-8.906
	(5.093)	(3.988)	(2.900)	(7.024)	(7.189)
VOLL	0.554	-0.521	-0.235	-1.619	-2.883*
	(0.898)	(0.644)	(0.418)	(1.386)	(1.527)
F-stat	1.24	0.66	10.56***	5.08***	5.71***
R-squared	0.1645	0.1394	0.3095	0.3942	0.3712
N	41	41	41	41	41

Notes: This table presents the results of the cross-sectional regression. Standard errors are reported in parenthesis. Significance level is shown as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. [-5,-1], [-3,-1], [0,0], [+1,+3], and [+1,+5] indicate the pre-event, event, and post-event windows of different lengths.

3.4. Cross-sectional results

The heterogeneous impact of the event across different sample nations underscores the importance of examining country-specific variables that can shed light on the post-event *CARs*. In Table 6, several noteworthy findings emerge. Firstly, the *Dummy variable DEV* shows a significant negative relationship with *[+1,+3] CARs*, indicating that developed nations experienced a short-term decline in *CARs*. However, the insignificant *DEV* in the other windows suggests that the impact may be temporary. Secondly, *BDGDP* reveals a significant negative relationship with *CARs* on the event day but a positive relationship during the windows *[+1,+3]* and *[+1,+5]*, suggesting that while the immediate reaction to robust banking sector development is negative, nations with a strong banking sector experience higher post-event CARs. Likewise, *ZS* significantly negatively (positively) drives the event day (*[+1,+3]*) *CARs* indicating that countries with robust banking sector stability enjoy positive abnormal returns in the post-event period. Interestingly, *GDP* shows a significant positive impact only on *[+1,+3] CARs*, suggesting that it may have a more immediate effect. On the other hand, *PSTR* and *VOLL* negatively drive the *CARs* during the *[-5,-1]* and *[+1,+5]* windows, respectively, but the *CARs* are insignificant during the rest of the windows, indicating that these variables may have a limited impact on post-event *CARs*.

3.5. Abnormal volatility during the event window

Following Kumari et al. (2023), we examine the impact of the SVB collapse on the daily volatility of the indices. We use the range volatility measure (natural log of high price - natural log of low price) (Alizadeh et al., 2002; Floros, 2009). After calculating the daily volatility, we employ the ESM to calculate abnormal volatility during the event window. Table 7 presents the global sample's daily average abnormal volatility (*AAV*) and cumulative average abnormal volatility (*CAAV*). We find that while the pre-event period has significantly lower volatility, the post-event period experienced significantly higher volatility. The event day abnormal volatility is

Table 7
Average and cumulative average abnormal volatility for the global stock markets.

Days	AAV	AAV_t	CAAV	$CAAV_t$
t-5	-0.34***	-3.49	-0.34	-1.42
t-4	-0.19**	-1.99	-0.53**	-2.45
t-3	-0.20**	-2.07	-0.73***	-3.78
t-2	-0.19*	-1.91	-0.92***	-5.47
t-1	-0.40***	-4.08	-1.32***	-9.58
t	0.05	0.53	-1.26***	-13.01
$t+1$	0.99***	10.23	-0.27**	-1.97
$t+2$	0.48***	4.96	0.21	1.26
$t+3$	0.93***	9.57	1.14***	5.88
$t+4$	0.44***	4.58	1.59***	7.30
$t+5$	0.68***	6.96	2.26***	9.51

Notes: This table presents the average abnormal volatility (AAV) and cumulative average abnormal volatility (CAAV) for the global sample. t-values are presented in parentheses. *, **, and *** indicate p-values less than 0.10, 0.05, and 0.01, respectively. The daily range volatility could be calculated only for 52 indices; hence, the sample size in this analysis is 52.

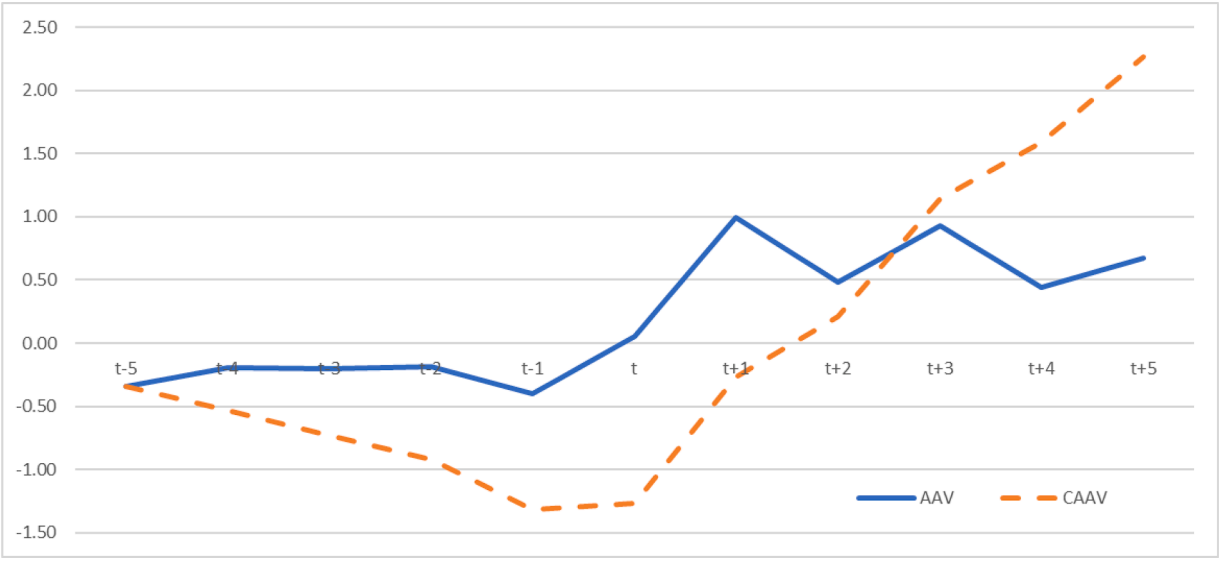

Fig. 5. AAV and CAAV during the event window.

insignificant. The results indicate that, on average, the global indices have been more volatile during the post-event period. Fig. 5 graphically presents the *AAV* and *CAAV* during the event window, indicating that the global markets have been more volatile after the SVB collapse.

4. Conclusions and future research avenues

Using a comprehensive ESM approach, we find that the SVB collapse significantly impacted global, regional, and country-level stock markets. The negative returns were observed from the event day to $t + 4$ in the global markets, with the developed markets being more vulnerable than emerging markets. The impact on different regions varied: the Americas, Middle East, and African markets experienced significant negative returns in the short term, while European markets were impacted over a longer time horizon. Additionally, the Asian markets experienced two significant positive returns on $t + 3$ and $t + 5$. The impact was also heterogeneous across countries, with some countries being more affected than others. Significant abnormal volatility characterizes the post-event period. The cross-sectional analysis reveals that countries with robust banking sector development and stability enjoy positive abnormal returns in the post-event period.

The findings provide important implications for investors and policymakers. First, the impact of external shocks on financial markets can vary significantly across regions due to differences in market characteristics and economic fundamentals. Therefore,

Appendix A1
Sample details.

Index Code	Country	Market	Region
.AXJO	Australia	Developed	AsiaPacific
.BVSP	Brazil	Emerging	Americas
.BFX	Belgium	Developed	Europe
.AEX	Netherlands	Developed	Europe
.PSI	Portugal	Developed	Europe
.ATX	Austria	Developed	Europe
.EGX30	Egypt	Emerging	MEA
.SETI	Thailand	Emerging	AsiaPacific
.SPCLXIGPA	Chile	Emerging	Americas
.MXX	Mexico	Emerging	Americas
.FTFBMKLCI	Malaysia	Emerging	AsiaPacific
.ISEQ	Ireland	Developed	Europe
.JTOPI	Price	Emerging	MEA
.SPBLPGPT	Peru	Emerging	Americas
.NZ50	New Zealand	Developed	AsiaPacific
.OMXC	Denmark	Developed	Europe
.OSEAX	Norway	Developed	Europe
.PX	Czech Republic	Emerging	Europe
.QSI	Qatar	Emerging	MEA
.BUX	Hungary	Emerging	Europe
.ADI	UAE	Emerging	MEA
.MERV	Argentina	Emerging	Americas
.PSI	Philippines	Emerging	Europe
.STI	Singapore	Developed	AsiaPacific
.FTWICOLL	Colombia	Emerging	Americas
MIJO00000PJO	Jordan	Emerging	MEA
.BKM50	Kuwait	Emerging	MEA
SPLK20LP	Sri Lanka	Emerging	AsiaPacific
KSE	Pakistan	Emerging	AsiaPacific
MSX30	Oman	Emerging	MEA
.GSPTSE	Canada	Developed	Americas
.SSEC	China	Emerging	AsiaPacific
.OMXHPI	Finland	Developed	Europe
.FCHI	France	Developed	Europe
.TA35	Israel	Developed	MEA
.TASI	Saudi Arabia	Emerging	MEA
.GDAXI	Germany	Developed	Europe
.HSI	Hong Kong	Developed	AsiaPacific
.ATG	GREECE	Emerging	Europe
.OMXVGI	Lithuania	Emerging	Europe
.WIG	Poland	Emerging	Europe
.IBEX	Spain	Developed	Europe
.OMXS30	Sweden	Developed	Europe
.SSMI	Switzerland	Developed	Europe
.FTSETW50	Taiwan	Emerging	AsiaPacific
.XU100	TURKEY	Emerging	Europe
.FTSE	UK	Developed	Europe
.FTAS	Italy	Developed	Europe
.BSESN	India	Emerging	AsiaPacific
.KS11	Korea	Emerging	AsiaPacific
.JKSE	Indonesia	Emerging	AsiaPacific
.N225	Japan	Developed	AsiaPacific
.DJI	US	Developed	Americas

Notes: This table presents the sample details. MEA indicates the Middle East and Africa.

investors and policymakers should consider regional dynamics when analyzing the effects of global events on financial markets and managing risks effectively, particularly the banking sector stability and development parameters. Second, the heterogeneous impact of the SVB collapse on different countries and regions underscores the importance of diversifying portfolios across countries and regions to minimize exposure to idiosyncratic risks. Third, the post-event *CARs* for many countries suggest that negative sentiment towards the banking sector characterized the post-event period. Investors and policymakers should monitor market sentiment towards the banking sector and take appropriate measures to restore confidence in the sector if necessary.

Appendix A2
Variables defined.

Variables	Abbreviations	Measure	Source
Developed nations	*DEV*	Dummy variable which takes *one* for developed nations, *0* otherwise	Based on the MSCI market classification
Banking sector development	*BDGDP*	The total value of demand, time, and saving deposits at domestic deposit money banks as a share of GDP. Deposit money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits.	Global Financial Development Database, September 2022 version (https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database)
Banking sector stability	*ZS*	The Z-Score captures the probability of default of a country's commercial banking system.	Global Financial Development Database, September 2022 version (https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database)
Gross Domestic Products	*GDP*	The monetary market value of all final goods and services made within a country during a specific period.	https://ceoworld.biz/2022/03/31/economy-rankings-largest-countries-by-gdp-2022/
Inflation	*INF*	Consumer price index	https://tradingeconomics.com/country-list/inflation-rate
Past returns	*PSTR*	Average returns for the last 30 days prior to the start of the event window	Based on data collected from www.investing.com
Past Volatility	*VOLL*	Average standard deviation of the returns during the estimation window	Based on data collected from www.investing.com

Appendix A3
Descriptive statistics.

Variables	Observations	Mean	Std. Dev.	Min	Max
CAR [-5,-1]	53	0.41	1.65	-3.37	4.27
CAR [-3,-1]	53	0.25	1.18	-2.68	3.47
CAR [0,0]	53	-0.92	0.92	-4.17	1.00
CAR [+1,+3]	53	-2.78	2.63	-12.86	1.39
CAR [+1,+5]	53	-3.28	2.86	-10.56	1.16
DEV	41	0.46	0.50	0.00	1.00
BDGDP	41	95.24	63.58	31.01	402.94
ZS	41	17.25	10.37	4.32	50.11
GDP	41	1432.81	2975.47	47.50	18,463.13
INF	41	10.58	9.96	1.00	55.18
PSTR	41	0.03	0.08	-0.13	0.37
VOLL	41	1.16	0.32	0.35	2.19

Notes: This table presents the summary statistics for the variables.

The present study is focused on the leading indices of sample nations. However, future studies could include conducting sectoral/industry-level analyses, incorporating moderating variables, assessing long-term effects, and conducting cross-country and cross-event comparisons. Examining how global events impact different sectors or industries could provide insights into patterns of heterogeneity. Additionally, moderating variables such as economic conditions, financial regulations, and industry characteristics could help explain differences in significance across countries or sectors. Assessing the long-term effects of external shocks on sectors or industries and comparing impacts across events or countries could deepen our understanding of market reactions. Further research in these areas could provide a more nuanced understanding of the implications of external shocks on financial markets, with potential implications for investment strategies and policy interventions.

CRediT authorship contribution statement

Dharen Kumar Pandey: Conceptualization, Data curation, Formal analysis, Software, Writing – original draft. **M.Kabir Hassan:** Project administration, Supervision. **Vineeta Kumari:** Writing – original draft. **Rashedul Hasan:** Project administration, Writing – review & editing.

Data availability

Data will be made available on request.

Appendix

Appendix A1, Appendix A2, Appendix A3

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