Summary: Market Outages

Overview

This summary provides an overview of the 'Market Outages' final report published by The International Organization of Securities Commissions (IOSCO) in June 2024. The report delves into the phenomenon of market outages, their implications for securities trading venues, and the measures that can be taken to mitigate their impact. It presents findings from a survey on market outages that occurred between 2018 and 2022, discusses the feedback received on a consultation report, and outlines good practices for trading venues to adopt in order to improve operational resilience and market integrity during such events.

Section 1: Introduction

The introduction of the IOSCO report on market outages sets the stage for a comprehensive analysis of the disruptions in securities trading venues, particularly equities listing trading venues, due to technical or operational issues. It outlines the scope of the report, which is informed by a survey of market outages from 2018 to 2022 and builds on IOSCO's previous work on operational resilience and business continuity. The report examines the causes and impacts of market outages, the effectiveness of communication and response strategies, and proposes good practices for trading venues to enhance resilience and maintain market integrity during such events. These practices include the development of outage plans, communication strategies, and post-outage analysis, with a focus on adaptability across different trading venues and asset classes.

Section 1.1: Background

Market outages, defined as disruptions in trading venues due to technical or operational issues, can significantly affect the trading of securities, particularly on listing trading venues which are primary platforms for the securities they list. These outages can hinder order processing, trade execution, and the publication of confirmed trades, leading to a temporary halt in trading activities. The impact is more pronounced on listing trading venues due to their high liquidity and diverse participant base. In jurisdictions with a single trading venue, outages can be especially disruptive, whereas in areas with multiple venues, trading may shift to alternative platforms, although this depends on various factors.

Outages impacting the opening or closing auctions are particularly risky as they can affect price discovery, benchmarking, index calculation, and the pricing of derivatives and funds. Such incidents have occurred in several IOSCO jurisdictions, disrupting market functions and prompting different recovery approaches by trading venues. The report highlights the importance of operational resilience, noting that regulators worldwide are focusing on enhancing it through legislative and regulatory changes. Some jurisdictions have established specific requirements for trading venues and market participants to ensure market integrity during outages.

Section 1.2: Project mandate

In June 2022, the IOSCO Board tasked Committee 2 with examining recent market outages to derive lessons and explore additional regulatory guidance to enhance market-wide resilience. This initiative aimed to ensure, as much as possible, the maintenance of orderly trading during outages. While previous IOSCO reports have tackled market outages with a focus on critical system risk management and business continuity, this Final Report expands the scope by analyzing outages from a broader market-wide resilience standpoint, building upon earlier operational resilience analyses.

Section 1.3: Survey

The survey section of the IOSCO report on market outages investigated the occurrence and management of recent market outages at equities listing trading venues from 2018 to 2022. It explored the regulatory rules and practices across different jurisdictions, organizational requirements for trading venues, and the protocols for market participants during outages. The survey's findings, which are detailed in Annex A, reflect responses from 24 regulatory authorities that are members of IOSCO. These insights contribute to the report's analysis of market outages, their impact, and the development of recommended good practices for enhancing operational resilience.

Section 1.4: Previous IOSCO work

The International Organization of Securities Commissions (IOSCO) has previously addressed issues concerning market outages and recommended various mitigating actions. Notably, a July 2022 report examined operational resilience during the COVID-19 pandemic, identifying trading venue closures unrelated to technological failures or business continuity planning. The 2015 report provided guidance on managing electronic trading risks and business continuity strategies to minimize disruptions, including market outages. Additionally, a 2021 thematic review underscored the requirement for some trading venues to conduct stress tests to ensure system performance during failures and outages, including identifying scenarios where trading systems can remain operational. These past efforts by IOSCO have contributed to the understanding and management of market outages, informing the development of good practices for trading venues to enhance market-wide resilience.

Section 1.5: Feedback on the Consultation Report

The IOSCO received 16 responses from various stakeholders to its consultation on proposed good practices for equities listing trading venues, which closed on March 1, 2024. These stakeholders included industry associations, regulatory authorities, trading venues, and service providers. The feedback has been reviewed and, where suitable, integrated into the final report. Additionally, Annex C of the report details the feedback on consultation questions and IOSCO's corresponding responses. The document also references the importance of operational resilience, as highlighted in the February 2021 IOSCO Board meeting, and builds on previous reports addressing electronic trading risks, business continuity, and operational resilience. Chapter 2 of the report provides an overview of legislative and regulatory frameworks across surveyed jurisdictions, which encompass business continuity, disaster recovery, operational resilience, notification requirements, and operational systems and controls.

Section 2: Key Findings from Recent Market Outages

The IOSCO survey collected data on market outages at listing trading venues from 2018 to 2022, examining their causes, impacts, and the responses to them. It also explored the organizational requirements and arrangements of trading venues and market participants. IOSCO members gathered information from trading venues within their jurisdictions or used recently acquired information from these venues to respond to the survey. The survey's findings contribute to understanding how market outages affect trading processes and inform recommendations for enhancing market resilience.

Section 2.1: Market structure

Most jurisdictions surveyed have a range of two to seven equities listing trading venues. Less than half of these jurisdictions host alternative trading venues. In cases where alternative venues are present, they may not be available for every listing trading venue or for all securities listed. Additionally, some alternative trading venues are located in foreign jurisdictions, separate from where the primary listing trading venues are situated.

Section 2.2: Incidents of recent market outages on listing trading venues

Between 2018 and 2022, survey respondents reported a total of 42 market outages across listing trading venues, with a declining trend from 16 in 2018 to just three in 2022. The jurisdiction with the most outages experienced six, while the second most affected had five, four of which occurred at the same venue. Approximately one-third of the jurisdictions did not report any outages during this period. The survey, which forms the basis of Chapter 3's findings, received responses from 24 regulatory authorities. It is noted that some jurisdictions have only one listing trading venue, and there is one jurisdiction without any such venues.

Section 2.3: Causes of market outages

Between 2018 and 2022, market outages in IOSCO jurisdictions were primarily caused by software and hardware issues, with some incidents involving both. Software problems included failed software releases, invalid instructions from exchange members, and issues restarting systems after maintenance. Hardware failures ranged from central storage malfunctions to memory module issues and power outages due to faulty equipment. Operational issues also contributed to outages, such as third-party access errors leading to server disconnections and late-stage securities pricing errors undetected in testing. System capacity was a less frequent cause, with one instance of message congestion causing connectivity and processing delays. Network issues were noted, including an outage during the setup of a new trading venue. Other miscellaneous causes included false fire alarms and actual fire incidents.

Section 2.4: Resumption of trading

Trading outages occurred at various times throughout the day, with a slight increase in the morning, but were not more frequent at market open or close. The majority of trading venues managed to resume operations within the same session at the primary site. When trading did not resume on the same day, it was due to issues with backup facilities, the need for extended problem investigation and resolution, or concerns about market readiness. In some cases, trading resumed on the following business day. To facilitate the resumption of trading, venues typically employed opening or re-opening call auctions, in line with their established outage protocols.

Section 2.5: Parts of the trading process affected

Market outages have been found to disrupt various stages of the trading cycle, typically impacting the entire process from order entry and matching to clearing and settlement. However, certain outages were confined to specific trading segments when platform modules operated independently.

Section 2.6: Closing auctions / closing prices

Market outages have led to interruptions in the production and update of indices, benchmarks, and reference prices, affecting trading activities. When outages prevent closing auctions, various alternative methods are employed to determine closing prices. Some trading venues opt for the last traded price before the outage, while others use the mid-point of the best bid/offer price at the time of the outage. In jurisdictions with multiple trading venues, such as the United States, more complex procedures exist, including the use of consolidated tapes for equity markets data and contingency plans that may designate an alternate exchange to determine the official closing price. Additionally, protocols in the United States and Canada may involve volume-weighted average prices, the consolidated last-sale, or the previous trading day's closing price. Other jurisdictions handle the determination of closing prices on a case-by-case basis, assessing each incident individually.

Section 2.7: Business continuity plans

All jurisdictions require trading venues to have business continuity plans, with many also mandating a disaster recovery site in a different geographical location. Regular rehearsals of contingency scenarios, including market outages, are conducted by some listing trading venues, enhancing market resilience. Industry-wide business continuity testing is either mandated or encouraged by national regulators in certain jurisdictions, with some requiring market participants' involvement in these tests. In one case, an industry-wide test checks the effectiveness of recovery and backup sites, while another jurisdiction has seen success in promoting voluntary participation in such exercises.

Section 2.8: Communication with the regulator

Market outages are communicated to market participants through real-time notices, and trading venues are required to inform their regulators immediately through email or phone as per their notification obligations. In cases where outages have cross-border effects, foreign regulators are also informed.

Section 2.9: Post-outage response

Following market outages, most jurisdictions undertake a review process to analyze the incident and learn from it. These analyses are carried out by various entities, including trading venues, regulatory bodies, or independent third parties, depending on the jurisdiction. However, the resulting reports detailing the analysis, remedial actions, and recommendations made by national regulators are only made public in a limited number of jurisdictions.

Section 2.10: Market outage policies and procedures

Trading venues employ various tools and dedicated teams to monitor and detect system disruptions, assessing the scope and impact of any incidents. They have established policies and procedures for responding to market outages, including incident response playbooks, business continuity and disaster recovery plans, and incident management plans, which are applied based on the incident's nature and severity. Many venues also maintain disaster recovery sites in different geographical locations to ensure trading continuity in case of operational failures at the primary site.

Information about market outages is communicated to market participants following standard protocols, detailing the incident's nature, impact, mitigation actions, and expected duration. Trading venues aim to resume trading as quickly as possible, with the timing dependent on the resolution of the cause and confidence in safely reopening the market. They follow specific procedures for the pre-opening phase to ensure a fair and orderly market reopening, considering risks associated with open orders.

In jurisdictions with multiple trading venues, there are efforts to maintain trading continuity during an outage by developing industry protocols that facilitate order routing to operational venues, addressing issues related to market fragmentation.

Section 2.11: Impact on market participants

Listing trading venues play a pivotal role in the securities market, often leading the price discovery process and serving a broad array of market participants. When these venues experience outages, the absence of a price can lead to increased uncertainty about the fair value of securities, resulting in wider bid-offer spreads and reduced trade volumes. The specific impact of an outage varies depending on the event's circumstances and root cause. Potential consequences include uncertainty about order fulfillment, liquidity issues, challenges in meeting best execution obligations, difficulties in initiating trading without an opening auction, the absence of a closing auction affecting pricing benchmarks and fund valuations, disruptions to equity derivatives trading, increased volatility upon trading resumption, clearing delays with possible margin calls, and reputational damage to the trading venue and the broader financial market.

Section 2.12: Migration of order flow

To ensure market resilience and integrity, jurisdictions with alternative trading venues focus on maintaining the continuity of trading during outages. Strategies like creating links between venues or enabling market participants to connect to multiple venues can facilitate continuous trading and accurate pricing. However, the technical requirements and associated costs may deter some participants from connecting to multiple venues. While there is no specific obligation for participants to connect to alternative venues during outages, larger participants often have such connections through direct membership, direct market access, or intermediation.

IOSCO members identified four scenarios regarding order flow migration during market outages: no alternative venues available, limited or no migration, material migration, or unquantifiable migration due to cross-border regulatory oversight. Some jurisdictions expect participants to have arrangements to submit orders to alternative venues during outages, while others require general policies for best execution during outages. Operational resilience arrangements typically include continuity of trading.

The presence of a consolidated tape in equities seems to encourage significant migration to alternative venues, suggesting it aids market resiliency by providing reliable pricing information. Interconnected alternative venues also support material migration of order flow. Despite the availability of alternative venues, their role in mitigating the effects of market outages is often limited due to factors such as the absence of price formation on the listing venue, liquidity impacts, participant connectivity limitations, lack of order status information, price uncertainty, differences in order types, coordination problems, and uncertainty around best execution policies during outages.

Section 2.13: Third-party providers

Trading venues often depend on external service providers for essential functions, including connectivity, operating matching engines, and determining settlement prices. Disruptions in these third-party services can lead to market outages. Survey respondents generally assess risks associated with operational processes and third-party services, including data protection. One trading venue, in collaboration with an independent technology consultant, reviewed and enhanced its IT infrastructure and risk management, leading to improved testing and monitoring capabilities. Other venues have implemented measures to better monitor technical issues following market outages, aiming to mitigate future disruptions.

Section 2.14: Cross-border / cross-trading venue implications

Market outages generally did not have cross-border causes and their impact was typically limited internationally. However, in cases involving depositary receipts or arbitrage strategies, an outage could affect price formation in multiple jurisdictions. Trading venues with shared infrastructure or links between them could also experience cross-venue implications during an outage. Public communication of outages was consistent across geographical locations, and regulatory authorities coordinated when outages had cross-jurisdictional links. IOSCO has identified five good practices for trading venues to enhance resilience, informed by previous work on operational resilience and findings from recent market outages.

Section 3: Good Practices for Trading Venue Resilience

IOSCO has formulated five good practices for trading venues to enhance market resilience during outages, drawing on insights from recent market disruptions and a comprehensive survey of equity listing trading venues. These practices are primarily tailored for equity markets but offer flexibility to be adapted to other asset classes. The good practices include recommendations on outage and communication plans, which are universally applicable across various trading systems and asset classes. However, some practices, such as those related to closing auctions, may not be relevant to all trading venues.

The report acknowledges the diversity of trading venues across jurisdictions and market structures, emphasizing that a one-size-fits-all approach is not feasible. Therefore, the good practices are principles-based, allowing for adaptability in implementation, subject to domestic legal and regulatory frameworks. Some jurisdictions may already have regulatory measures in place that align with or overlap these good practices.

IOSCO also notes that market outages can arise from various causes not covered by the survey, such as cyber-attacks, natural disasters, and dependencies on a limited number of third-party service providers. While the report does not present key findings on these additional causes due to a lack of survey evidence, the good practices are deemed generally suitable for application to outages resulting from these and other root causes. Nonetheless, IOSCO recognizes that specific circumstances, such as cyber-attacks, may necessitate a different or modified approach, especially where jurisdictions have particular regulations or guidelines for such incidents. IOSCO supports the use of judgment in applying the good practices to accommodate unique situations.

Section 3.1: Outage plans

Trading venues with effective outage plans and playbooks provide market participants with clarity on the actions to be taken during an outage, enhancing market confidence and resilience. IOSCO recommends that trading venues adopt good practices such as establishing a comprehensive outage plan detailing communication protocols, reopening strategies, arrangements for closing auctions, and methodologies for setting alternative closing prices. It is also advised that these plans be made accessible on the trading venue's website, with consideration for the appropriateness of public disclosure. Additionally, trading venues should outline clear governance arrangements, including roles, responsibilities, and training requirements. Regular reviews and testing of the outage plan, including scenario planning, stress testing, and communication protocol testing, are essential to ensure the plan's effectiveness.

Section 3.2: Communication plans

The survey results underscore the critical role of effective communication by trading venues during outages to maintain orderly trading conditions and enable market participants to manage risks, such as rerouting orders to alternative venues. Trading venues should have a formal communication plan for outages, detailing the dissemination method, recipients, and content. An initial notice should be published promptly on a widely accessible platform, possibly including the outage's nature, affected entities, system status, estimated reopening time, and key milestones. As all information may not be immediately available, subsequent updates should be provided regularly or as new details emerge, covering the status of orders, reopening methods, and alternative closing price methodologies. Specific communication channels should be maintained with affected parties and interconnected infrastructures to lessen the incident's impact.

Section 3.3: Reopening of trading

The section on the reopening of trading outlines the strategy for resuming trading activities after an outage has been resolved. Trading venues must consider their operational resilience, including business continuity and disaster recovery plans, to determine the appropriate approach for resuming trading. The reopening process should commence when it is safe and can be conducted in a fair and orderly manner. Key considerations for reopening include:

- Reopening strategy: Trading venues should have a clear strategy in their outage plan, detailing the management of orders before trading resumes and the time needed for market participants to prepare for reopening, considering the outage's nature, severity, trading system, and asset classes involved.

- Assessment: Criteria or thresholds must be established to determine when to reopen, such as the number of connected participants or the percentage of historical trading activity. If there is insufficient time left in the trading day, venues may extend trading hours or postpone the closing auction. Clarity on the status of orders is also necessary for market participants.

- Communication: Effective communication is crucial, and market participants should receive notice before trading resumes. Information about the reopening, including time, pre-opening phases, closing auction, and any extension of trading hours, should be communicated to all participants simultaneously.

- Pre-opening phase: A pre-opening phase may be included to allow market participants to access the market and check the status of their orders. Information about this phase should be communicated through channels accessible to all participants.

These elements are essential to ensure a smooth transition back to active trading and maintain market integrity.

Section 3.4: Closing auctions / closing prices

The section emphasizes the significance of the closing price from the closing auction in financial markets, serving as a benchmark for various financial activities and contractual obligations. It outlines the importance of having a robust plan in place for trading venues to handle market outages that may affect the establishment of closing prices. The recommended good practices include having a clear outage plan detailing the operation of the closing auction and the provision of alternative closing prices, effective communication strategies to inform market participants during an outage, prioritizing the execution of closing auctions, and establishing alternative closing prices if the auction cannot occur. These measures aim to maintain investor confidence and market transparency during outages.

Section 3.5: Post-outage plans

After a market outage, trading venues should conduct a thorough analysis to understand the cause, assess their response, and identify improvement areas. This post-mortem exercise is crucial for enhancing operational resilience, maintaining market integrity, and bolstering confidence among market participants and regulators. It should include a root cause analysis, remediation strategies, an evaluation of the outage handling, and an assessment of communication and decision-making processes. Trading venues are encouraged to share findings with regulators and create a remediation plan with clear timelines and responsibilities. Additionally, feedback from market participants can be solicited to refine future responses to outages. The final chapter of the report emphasizes the disruptive nature of market outages, particularly on equities listing venues, highlighting their negative effects on price discovery, market resilience, and the overall integrity of financial markets.

Section 4: Conclusion

The final report on market outages highlights the disruptive nature of such events, particularly on equities listing trading venues, and their negative effects on price discovery, market resilience, and the overall integrity of financial markets. Building on previous IOSCO work, the report presents key findings from recent outages and introduces five good practices for trading venues. These practices aim to enhance preparedness and management of future outages, thereby strengthening market-wide resilience. The recommendations include the adoption of comprehensive outage plans, effective communication strategies, and thorough post-outage analysis, which are intended to be flexible enough to be applicable across various trading venues and asset classes.