

Review of Circuit Breakers

Executive Summary

The objectives of this review were to assess the local design of circuit breakers and to recommend improvements. We have noted that the local design of securities-based price limits differs substantially from the general international design of index-based trading halts. Strength of the local design is that it is well customized to the local needs. Its weaknesses are that it does not adjust to changing price and turnover of a scrip and its thresholds are proving too narrow for the illiquid scrips. In view of these two weaknesses, Committee has proposed three alternatives. Alternative A provides relief to illiquid scrips by giving them wider thresholds. Alternative B divides scrips into different classes based on their price and turnover and then assigns customized circuit breakers that shall automatically change with the changing price and/or turnover. Alternative C uses index based trading halts in line with international practices. We recommend a phased implementation of the three alternatives where A shall be implemented immediately, B in the short term, and C in the long term when overall risk management has significantly improved.

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1. Background

Most of the stock exchanges throughout the world use circuit breakers for management of systemic risk.¹ Circuit breakers are extensively used because of the following benefits:

- They protect clearing-house from large defaults caused by extreme market movements
- They protect brokers and investors from defaults due to extreme price fluctuations, even when these individual defaults do not endanger the clearing-house
- They provide time-outs to the market when they get overheated and investors are unlikely to act rationally

The benefits offered by circuit breakers come at the following costs:

- They obstruct investors who wish to exit their positions
- They obstruct entry of bargain hunters, who play a key role in reviving the market
- They impede price discovery, which is a key reason for existence of a secondary market

In view of the importance of circuit breakers for risk management and the differences between local and international designs, SECP constituted a three-member committee on Nov 11, 2002 to review the local design.

2. Objectives of the Review

The Committee was given two objectives

- i. To assess the strengths and weaknesses of the local design of circuit breakers in the light of international best practices and local requirements; and
- ii. To recommend improvements in the local design.

3. Local Design of Circuit Breakers

Currently, the following design is being used in all three local exchanges:

- For downward circuit breakers, during a day price of a scrip cannot fall below 5% or Rs 1, whichever is higher, from the closing price of the previous day.
- For upward circuit breakers, during a day price of a scrip cannot rise more than 7.5% or Rs 1.5, whichever is higher, from the closing price of the previous day.

Current Circuit Breakers are in the form of order rejects, i.e. system rejects a bid or offer outside the circuit breaker thresholds. The current design was implemented on Dec 3, 2001 with symmetric upward and downward thresholds at 7.5% or Rs 1.5, whichever is higher. The downward circuit breaker was reduced in the May 2002 crisis when the market plummeted due to the threat of Indo-Pak war. Prior to Dec 3, 2001 a stock was turned spot if its price moved by 25% or Rs 5, whichever is higher.

¹ Systemic risk refers to the likelihood that the failure of one participant to meet its settlement obligations will cause other participants to be unable to meet theirs. This risk is present in the system because of the time lag between transaction and settlement, which is three days in a T+3 settlement cycle.

4. Comparison of the Local Design with International Designs

The committee has observed the following differences between the local design and the international design:²

- i. In most of the markets that the committee analyzed, circuit breakers are based on an index while our circuit breakers are based on individual securities.
- ii. Index-based circuit breakers use a series of trading halts depending on the index movement and the time when the circuit breaker threshold was hit, i.e. trading is suspended and then resumed after a specified interval and market is allowed to go down further. We have only one set of price limits regardless of when the circuit breaker was hit.
- iii. Internationally, index-based circuit breakers thresholds are fairly wide, starting from 10% and going up to 30%, i.e. prices of individual securities are virtually free. Our thresholds are the narrowest that the committee has seen anywhere.
- iv. Some exchanges, such as Australian Stock Exchange and Singapore Stock Exchange, do not have circuit breakers at all while a few, such as New York Stock Exchange and Kuala Lumpur Stock Exchange, only have a downward circuit breaker.

5. Assessment of the Local Design

After comparing different models, the Committee noted the following strengths and weaknesses of the local design:

5.1. Strengths of Local Design

- i. It is well tailored to local requirements. Due to the high degree of trading and consequently exposures concentration in a few scrips and overall weak risk management, it is appropriate to have circuit breakers in individual securities. Index-based circuit breakers are used by wide and deep markets with strong risk management. Radical price movements in individual scrips do not pose a threat to them.
- ii. A price limit suits our markets better than a trading halt. Trading halts are based on the index and they come in a series. Since we need to have circuit breakers in individual securities, we cannot have trading halts because a single transaction at the circuit breaker threshold can suspend trading in a scrip. Practically, a price limit acts like a trading halt because very little activity is witnessed once a scrip hits its circuit breaker.
- iii. It is logical to have only one set of price limits. Due to overall weak risk management we can only afford narrow thresholds that do not leave room for a series.
- iv. Downward circuit breakers are rightly kept narrow as they check bear-raids by blank sellers.

² The committee has consulted the circuit breaker models of a number of exchanges including Bombay Stock Exchange, Hong Kong Stock Exchange, Singapore Stock Exchange, Toronto Stock Exchange, London Stock Exchange, New York Stock Exchange, Australian Stock Exchange, Kuala Lumpur Stock Exchange etc

- v. Upward Circuit breakers are rightly kept wider than downward circuit breakers. Upward movements create risk for the outstanding blank and short positions and not for a genuine seller who has securities to deliver. Outstanding long positions are bound to be more than outstanding short or blank positions particularly because in the Carry Over Market, only a long position can be financed. At the same time upwards circuit breakers cannot be done away with because they help avoid bubbles and large Carried Over values caused by over-buying by speculators.
- vi. Current design rightly uses the same thresholds for both Ready & Futures market as Futures derive their value from the underlying stocks.
- vii. It is simple to understand and use. It uses an ingenious mix of both absolute (Rs) and relative (%) thresholds that caters for both very low price and very high price stocks.

5.2. Weaknesses of Local Design

- i. The current thresholds are proving very narrow for illiquid stocks that are subject to wider price fluctuations compared to the liquid stocks. A few illiquid stocks hit the circuit breakers everyday. Since their turnover is minimal and they do not pose a threat to the clearing-house or to the members, having narrow thresholds for such stocks is not justified.
- ii. Because of constant percentage thresholds, the current circuit breakers become linearly wider as the price of a stock goes up and linearly narrower when the price of a stock goes down. For instance, when a stock is trading at Rs 100, 7.5% upward circuit breaker is Rs 7.5 but when it reaches 200, 7.5% of 200 becomes Rs 15. Since all payments are absolute (Rs) and not relative (%), it is important that circuit breakers should increase at a decreasing rate and vice versa.
- iii. Lahore Stock Exchange (LSE) and Islamabad Stock Exchange (ISE) have to update their circuit breakers using the closing prices at Karachi Stock Exchange (KSE) for the inactive scrips. This is because a scrip listed on all three exchanges may be traded only on KSE. Once its price at KSE has moved close to or beyond the circuit breakers at LSE & ISE, it would become difficult to trade that scrip at the other exchanges.

6. Guiding Principles in Developing Alternative Models

The committee established the following principles for guiding the development of alternative models:

- i. Circuit Breakers are only one of a number of inter-linked risk management measures and they are meant for extreme situations and not for day-to-day risk management.
- ii. Circuit breaker for a scrip should take into account both price and turnover. Risk is best measured as exposures and the losses incurred on the outstanding positions vis-à-vis the ability to pay of the trading member. Both the size of exposures and losses depends on (i) Volume outstanding, not settled or squared & (ii) Scrip prices.

- iii. Circuit Breakers should be dynamic. They should get automatically adjusted with the changing price and/or volume of a scrip
- iv. Circuit Breakers should only cause as much disruption to market activity as is necessary.
- v. Circuit Breakers should not create undue complexity for the traders.
- vi. In view of dual or triplicate listings and simultaneous trading across KSE, LSE, & ISE, the same threshold should be used at all three exchanges, as practiced now.

The committee has developed three alternative models, “A Two Slabs”, “B Price-Volume Matrix”, and “C Index-based Trading Halt.”

Committee has checked with the information technology department at KSE that it is possible to implement all three alternatives, given enough time and clear specifications.

7. Alternative A – Two Slabs

- Keep the existing circuit breakers as they are except for those scrips with an average daily turnover of less than 50,000.
- The circuit breakers for those shares with an average daily turnover of less than 50,000 shall be kept wider, as follows:
 - For downward circuit breaker, Rs 5 or 7.5% whichever is higher
 - For upward circuit breaker, Rs 7.5 or 10% whichever is higher
- The circuit breakers of a share shall become narrower as per the current design if the moving average of five day’s turnover is 50,000 shares or more. The circuit breakers shall become wider if the moving average of 10 day’s turnover is less than 50,000 shares. Both the moving averages shall exclude the days a scrip is SPOT.
- The circuit breakers shall be displayed on the trading terminal, making them user-friendly.
- Circuit Breakers shall be automatically calculated every day after the closure of the market.
- KSE shall notify its circuit breakers through its website to all concerned including LSE & ISE, which would use the same circuit breakers.

7.1. Strengths of Two -Slabs

- i. Relief is provided to the less-liquid stocks without increasing risk to the clearing-house.

- ii. It incorporates both price and, to some extent, turnover. The threshold for the average daily turnover has been carefully chosen after analyzing the data for all stocks at KSE from Jan to Nov 2002. Stocks with an average daily turnover of less than 50,000 shares are more than 600 in number but account for only 2% of the total market. There is unlikely to be any frequent movement across the thresholds.

7.2. Weaknesses of Two -Slabs

- i. Alternative A has not addressed the problem of dynamism as explained in 5.2(ii).
- ii. For scrips lying close to the 50,000 turnover limit, circuit breakers might change frequently.

8. Alternative B – Price-Volume Matrix

- Classify each scrip in a Price & Volume Matrix. For instance shares with a price of less than Rs 5 and an average daily turnover of less than 5,000 shall be placed in ‘Class 1’.
- Determine the best circuit breaker for each class. For such low price and illiquid shares as in “Class 1” no downward circuit breaker is needed. The upward circuit breaker may be set at Rs 25.
- A scrip shall change its class if its 5 day moving average of price or average daily turnover, excluding SPOT days, falls in another class, whichever is earlier.
- The matrix shall be automatically updated at the end of every day.
- The applicable circuit breaker for each scrip shall be displayed on the trading terminal.
- The matrix shall be reviewed quarterly.

8.1. Strengths of Price-Volume Matrix

- i. It gives a customized circuit breaker for every individual class according to its price and turnover.
- ii. It is highly dynamic – as a share changes its price and/or turnover, its classification shall change and so shall its circuit breakers.

8.2. Weaknesses of Price-Volume Matrix

- i. It might be difficult for the market players to understand the concept underlying the matrix based circuit breakers.
- ii. A large matrix can be difficult to devise, as every class shall have to be given its own customized circuit breaker.

Price-Volume Matrix (Downward Circuit Breakers)

The Matrix given below is a sample made for illustration. The actual Matrix shall be implemented after extensive simulation using past data and making adjustments to this sample Matrix wherever necessary

- Circuit Breakers become narrow as price and/or turnover of a scrip rises and vice versa
- Not having a downward circuit breaker is the same as –100%
- For low price stocks, a mix of absolute (Rs) and relative (%) circuit breakers are used

| Turnover Ranges | Price Ranges | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|--------------|-----|-------|-----|-------|------|-------|-----|-------|-----|--------|--|--------|--|--------|--|--------|--|--------|--|-------|--|-------|--|
| | P<= 5 | | P>5 | | P>10 | | P>20 | | P>30 | | P>50 | | P>75 | | P>100 | | P>150 | | P>200 | | P>250 | | P>300 | |
| | P<=10 | | P<=20 | | P<=30 | | P<=50 | | P<=75 | | P<=100 | | P<=150 | | P<=200 | | P<=250 | | P<=300 | | | | | |
| | Rs | | Rs | | Rs | | Rs | | Rs | | Rs | | Rs | | Rs | | Rs | | Rs | | Rs | | Rs | |
| <=5,000 | | | | | | | | | | | | | | | | | | | | | | | | |
| 5,000<T<=10,000 | | | | | | | | | | | | | | | | | | | | | | | | |
| 10,000<T<=20,000 | | | | | | | | | | | | | | | | | | | | | | | | |
| 20,000<T<=50,000 | 50% | 1.0 | 40% | 2.5 | 35% | 5.00 | 25.0% | 7.5 | 20.0% | | | | | | | | | | | | | | | |
| 50,000<T<=100,000 | 40% | 1.0 | 30% | 2.5 | 30% | 3.00 | 20.0% | 5.0 | 17.5% | | | | | | | | | | | | | | | |
| 100,000<T<=250,000 | 25% | 1.0 | 25% | 2.5 | 25% | 2.50 | 15.0% | 2.0 | 10.0% | | | | | | | | | | | | | | | |
| 250,000<T<=500,000 | | 1.0 | | 2.0 | | 2.00 | 10.0% | 1.5 | 9.0% | 2.5 | | | | | | | | | | | | | | |
| 500,000<T<=750,000 | | 1.0 | | 1.5 | | 1.50 | 7.5% | 1.5 | 9.0% | 2.5 | | | | | | | | | | | | | | |
| 750,000<T<=1,000,000 | | 1.0 | | 1.0 | | 1.00 | 7.5% | 1.5 | 7.0% | 2.5 | | | | | | | | | | | | | | |
| >1 million | | 1.0 | | 1.0 | | 1.00 | 6.5% | 1.5 | 6.0% | 2.5 | | | | | | | | | | | | | | |

Examples

- For scrips with a price less than or equal to Rs 5 and an average daily turnover of more than 20,000 but less than or equal to 50,000 shares, the downward circuit breaker is 50% or Rs 1, whichever is higher
- For scrips with a price greater than Rs 10 but less than or equal to Rs 20 and an average daily turnover of greater than 1 million shares, the downward circuit breaker is Rs 1.
- For scrips with a price of more than Rs 50 but less than or equal to Rs 75, and an average daily turnover of greater than 500,000 shares but less than or equal to 750,000 shares, the downward circuit breaker is 7%

Price-Volume Matrix (Upward Circuit Breakers)

The Matrix given below is a sample made for illustration. The actual Matrix shall be implemented after extensive simulation using past data and making adjustments to this sample Matrix wherever necessary

- Upward circuit breakers have been kept wider than downward circuit breakers
- Circuit Breakers become narrow as price and/or turnover of a scrip rises

| Turnover Ranges | Price Ranges | | | | | | | | | | | | |
|----------------------|--------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| | P<= 5 | P>5 | P>10 | P>20 | P>30 | P>50 | P>75 | P>100 | P>150 | P>200 | P>250 | P>300 | |
| | P<=10 | P<=20 | P<=30 | P<=50 | P<=75 | P<=100 | P<=150 | P<=200 | P<=250 | P<=300 | | | |
| | Rs | Rs | Rs | Rs | | | | | | | | | |
| <=5,000 | 25.0 | 30.0 | 35.00 | 40.0 | 100.0% | 85.00% | 80.00% | 75.00% | 50.00% | 35.00% | 25.00% | 20.00% | |
| 5,000<T<=10,000 | 20.0 | 25.0 | 30.00 | 35.0 | 100.0% | 60.00% | 65.00% | 45.00% | 50.00% | 50.00% | 50.00% | 12.50% | |
| 10,000<T<=20,000 | 15.0 | 20.0 | 25.00 | 30.0 | 100.0% | 50.00% | 45.00% | 35.00% | 30.00% | 20.00% | 15.00% | 10.00% | |
| 20,000<T<=50,000 | 10.0 | 15.0 | 10.00 | 35.00% | 20.0% | 18.50% | 15.00% | 12.50% | 10.00% | 10.00% | 10.00% | 10.00% | |
| 50,000<T<=100,000 | 5.0 | 10.0 | 8.00 | 30.00% | 17.5% | 15.00% | 10.00% | 8.00% | 8.00% | 8.00% | 8.00% | 8.00% | |
| 100,000<T<=250,000 | 3.0 | 5.0 | 7.00 | 25.00% | 10.0% | 10.00% | 8.00% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | |
| 250,000<T<=500,000 | 1.5 | 2.5 | 2.50 | 10.00% | 9.0% | 8.00% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | |
| 500,000<T<=750,000 | 1.5 | 2.0 | 2.00 | 7.50% | 2.0 | 9.0% | 8.00% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | |
| 750,000<T<=1,000,000 | 1.5 | 1.5 | 1.50 | 7.50% | 2.0 | 7.5% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | |
| >1 million | 1.5 | 1.5 | 1.50 | 7.50% | 2.0 | 7.5% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | 7.50% | |

Examples

- For scrips with a price greater than Rs 10 but less than or equal to Rs 20 and an average daily turnover of greater than 1 million shares, the downward circuit breaker is Rs 1.50.
- For scrips with a price of more than Rs 50 but less than or equal to Rs 75, and an average daily turnover of greater than 500,000 shares but less than or equal to 750,000 shares, the upward circuit breaker is 8%

9. Alternative C – Index-based Trading Halts

Committee is of the view that in the long term our exchanges should also follow the international model and use index-based series of trading halts.

The following conditions would need to be met before the implementation of the above:

- i. Overall better risk management, particularly pre-trade margin verification and rationalization of the level and form of margin deposits.
- ii. Development of an index of highly liquid securities that can be used for trading halts, as KSE-100 is not fit for the purpose.
- iii. Implementation of a system for effectively countering blank selling.

The proposed design of the index-based circuit breaker is as follows:

- If the index falls by a pre-specified limit, say 7.5%, trading is halted across the board for 30 minutes and then resumed if the remaining market time is more than 1 hour.
- If the index falls by another limit, say 10%, at any point in time, trading is suspended for the rest of the day.
- For stocks not included in the index, additional, wider, and specific circuit breakers shall apply as per the Price-Volume matrix.

9.1. Strengths of Index-Based Trading Halts

- i. It shall cause far less disruption to the individual scrips than securities based price limits.
- ii. It provides more room for exit to investors than price limits.
- iii. It caters for the illiquid stocks.
- iv. Index-based halt is easy to understand.

9.2. Weaknesses of Index-based Trading Halts

- i. Internationally, index-based circuit breakers are usually static and reviewed every quarter.
- ii. Trading halt is more likely to trigger curb trading than a price limit.

10. Conclusion & Recommendations

The committee concludes that the local design of the circuit breakers is different from the widely used international design due to concentration of liquidity and overall weak risk management in our stock markets.

- The Committee would like to recommend that the proposed alternatives be implemented in a phased manner as below:
 - i. Implement Alternative A “Two Slabs” immediately.
 - ii. Replace Alternative A with Alternative B “Price Turnover Matrix” in the short term.
 - iii. Replace Alternative B with Alternative C “Index-based Trading Halts” in the medium to long term.
- To improve transparency, KSE should display the circuit breakers for every scrip on its website and also provide a daily time-wise circuit breaker report highlighting all scrips that hit their circuit breakers during a day.