

## Chapter 7.

### Policy Implication: Why Do We Need Circuit Breakers?

The evidence of the previous chapters casts doubt on the rationale for circuit breakers. We should reexamine the presumed benefits and costs of circuit breakers based on the above results. The existing arguments for circuit breakers can be broken down into the following although they are related to each other.

The first argument addresses psychological reasons. That is, circuit breakers may provide a cooling-off period and thereby prevent panic trading from spreading into the market. If circuit breakers help to restore investor confidence and prevent panic trading, a lower level of price volatility would be observed after circuit breakers are triggered. However, our results do not support such an argument. On the contrary, price movements became more volatile after circuit breakers are triggered. Moreover, the price overshooting phenomenon suggests that the existence of circuit breakers itself caused otherwise well-behaved traders to hold more optimistic or pessimistic beliefs. Evidence against circuit breakers can also be found from the October market crash (NYSE) in 1987. Following Friday, October 16 when the market fell by 6 percent, there was a natural circuit breaker (the weekend of October 17 and 18) which might have provided a cooling-off period. However, when the market reopened on October 19, massive selling pressure left the market with a 23 percent drop on that day. Two days of cool reflection only intensified the selling panic rather than reassuring investors.<sup>58</sup> This evidence together with our findings suggest that the

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<sup>58</sup>For a detailed description of the October market crash, see the Brady Report (1988), pp. 141-172.

purely psychological arguments for circuit breakers are at best tenuous.

The second argument for circuit breakers is that they reduce credit risks which can amplify feedback effects of price movements. Most exchanges allow traders to purchase securities by putting up only a portion of the amount purchased, and also require them to maintain the margin requirements.<sup>59</sup> If a customer's margin account equity falls below these requirements, the customer is required to put up more margin or securities are sold either by the customer or by the broker. In cases of large, sudden price drop, margin calls may force traders to dump their shares on the market, causing prices to drop further. Similar to the argument of bank runs, acceleration of such a process can lead to further credit risks and loss of financial confidence, which may result in frenetic trading. In the presence of such built-in market amplifiers, circuit breakers can prevent or retard the endogenous amplifying feedback effects by providing time for intraday margin calls to be made and for margin payments to be collected.

Since our empirical findings are based on the case where circuit breakers are narrowly specified, the beneficial effect of circuit breakers due to credit risks may not be fully appraised. However, the evidence of greater volatility after the lower limit-triggered event compared to the upper limit-triggered event may suggest that the adverse effects related to margin requirements are present in the market. Compared to upward price movements where there would be no "involuntary" counterpart, price declines cause traders to adjust their positions, thereby putting further downward pressure on price movements. In this context, the second argument for circuit breakers

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<sup>59</sup>Margin, in popular usage, is the amount put up by the investor using credit to buy securities. Different stock exchanges maintain their own margin requirements. For example, the NYSE sets requirements for the maintenance of margins so that a customer's margin account equity may at no time be less than 25% of the current market value of the stocks or marginable convertible bonds carried. For details, see the Fact Book of the NYSE (1992) pp. 68-69.

is considered to be strongly grounded. However, if the motive for trying circuit breakers is to break this amplifying feedback loops, there seems to be little reason to have circuit breaker bound so narrow. Circuit breaker bounds as narrow as the Korean ones are more likely to do harm than good.

The third argument comes from the possibility of failure of market making in response to a large (informationless) volume shock. In a market where market makers exist, selling orders are first absorbed by market makers who eventually transfer these orders to the ultimate value buyers. Proponents of circuit breakers argue that whereas this transmission mechanism works smoothly in normal situations, it can break down when the volume shock is large. They propose that circuit breakers might reduce this transactional risk by stimulating buyer responsiveness through a release of the market information to the public and also by relying on a batch auction to determine the opening price after a trading halt.

In evaluating this market microstructure argument, one can consider two possible cases of large price changes which are either information-based or noise-generated.<sup>60</sup> If price movements are based on new information, prices will approach a new equilibrium as time passes whether or not there are circuit breakers. In this situation, circuit breakers at best delay the incorporation of news into prices. Price volatility will also be pushed into later periods when circuit breakers are lifted. On the other hand, suppose that price changes are driven by uninformed panic trading. When huge orders come from one side of the market, prices will move away from what should be the equilibrium level based on fundamentals. Price movements become volatile until the panic subsides. Under such circumstances, circuit breakers might have beneficial effects on the price discovery process. For example, if panic selling is driven

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<sup>60</sup>Such a decomposition of source of price decline is suggested by Grossman (1990) and also by Kuhn, Kuserk and Locke (1990).

by rumors which cannot be justified by fundamentals, arrival of correct information while circuit breakers are triggered can help stabilize price movements. Also, information processed while circuit breakers are in effect might induce more value traders to come into the market. If these processes help reduce transactional risks, a lower level of price volatility should be observed after circuit breakers are lifted and the market reopens.

It is possible to rely on real market data to evaluate the effectiveness of circuit breakers. Contrary to what their proponents expect, the results of price overshooting and increased volatility indicate that circuit breakers were not effective in reducing transactional risks. While this study examined a market where market makers do not exist, other findings (McMillan (1990) and Kuhn, Kuserk and Locke (1990)) which analyzed the market maker setting also provide evidence of increased volatility after circuit breakers are triggered. Although the proponents have an *informationless* volume shock in mind, it is difficult to imagine a situation in which a large price change triggering a circuit breaker bound occur without a change in fundamentals. In fairness, it is more likely that panic trading mixed with an informational shock causes large price changes. However, it is hard for traders to distinguish one motive of trading from the other. The opening of order books does not tell traders whether one-sided orders are due to noise or information. Under such circumstances, circuit breakers can make people second-guess what is going on in the market, possibly frightening them from the market rather than reassuring them. The evidence presented in this dissertation suggests that this situation is likely to occur although we cannot conclusively refute the third argument for circuit breakers.

The fourth argument is related to the limited capacity of exchanges to cope with an unexpected large volume of orders. While the market infrastructure of

exchanges is designed to operate effectively for most trading volumes, peak loads exceeding the maximum capacity of exchanges are likely to occur. For example, during the October market crash of 1987, an unprecedented traffic of orders overwhelmed the existing capacity of the exchanges, creating congestion such as crossed markets, lost orders, unanswered telephones and so on. Such congestion can easily bring about additional uncertainty and confusion to the market participants, possibly precipitating further declines. In addition to the market infrastructure, the limited capital positions of market makers may provide another source of bottlenecks. The NYSE gives its specialists a monopoly franchise to trade particular stocks in return for their commitment to set a fair and orderly market such as maintaining price continuity.<sup>61</sup> When massive orders come from one side of the market, any attempt by a specialist to keep prices from changing more than an eighth at a time can quickly deplete his capital so that he is unable to perform his function. As noted in the Brady report (pp. 128-129), liquidity sufficient to absorb the limited selling demands of investors became an illusion of liquidity when confronted by massive selling, which ironically led traders to adopt strategies calling for liquidity far in excess of what the market could supply.

When the limited capacity of exchanges creates a bottleneck in the order flow transmission process, the market becomes closed *de facto*, which is tantamount to invoking an *ad hoc*, *informal* circuit breaker. Although our results showed the adverse effects of *formal* circuit breakers, such effects may become even worse when the market is closed unexpectedly. An abrupt, unexpected closing of the market due to exchange bottlenecks can make people speculate about even worse possible scenarios

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<sup>61</sup>A measure of price continuity is the size of the price variation from one trade to the next in the same stock. According to the Fact Book of the NYSE (1992), more than 95% of all transactions occurred with no change or an 1/8 point variation in 1990 and 1991. It is one business strategy adopted by the NYSE in an effort to reduce transaction price uncertainty and thereby inducing more customers. See for details the Fact Book of the NYSE (1992) and also Stoll (1985).

than the one where the new market clearing price is just above the circuit breaker triggered point.<sup>62</sup> Although expansion of a system's capacity including a specialist's capital position is one possible solution, it is quite likely inefficient to set aside extra resources only to absorb the very largest volume shocks if that capital is unnecessary most of the time. In this context, an argument for circuit breakers based on the potential for institutional breakdowns seems strongly credible.

The fifth argument for circuit breakers comes from a futures market perspective in that they contribute to the efficient functioning of the exchange. Brennan (1986) shows that price limits may act as a partial substitute for margin requirements in ensuring contract performance. Also, Miller (1990) asserts that price limits exist typically in a futures market to assure clearinghouse solvency. That is, in a situation where a large sudden price change can create moral hazard for "locals," a price limit gives the clearing firm time to remove potentially insolvent traders from the floor before they accumulate further losses.<sup>63</sup> These arguments give a clue to why price limits have long been a standard feature of futures contracts.

The possible adverse effect of circuit breakers analyzed in this study would be smaller for futures market since the price of a derivative asset is closely related to that of its primary asset. Although the presence of price limits may prevent the price of futures from approaching its equilibrium level, the market clearing price determined in a cash market provides information about what the equilibrium price in the futures market should be. In this sense, a futures market where large sudden price changes

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<sup>62</sup>Hong Kong's experience during the market crash in 1987 may provide an indication of the above argument. While the Hong Kong stock market is not equipped with a formal circuit breaker, the exchange was closed from Tuesday (Oct. 20) through the end of the week. When the market reopened after the *ad hoc* market closing, prices fell dramatically by almost 28 percent on that day, making Hong Kong the worst performer during the international market crash in 1987. See Roll (1989) for the comparative performance of major stock markets in 1987.

<sup>63</sup>The more detailed explanation is provided in the Literature Review (Chapter 2).

might pose problems for its particular trading, clearing and settlement technology appears to have its own different rationale for instituting price limits.

The above reexamination of the existing arguments based on our results reveals that justification of circuit breakers (at least in the cash markets) is more or less related to the organizational needs of exchanges to cope with huge order flows beyond the system's capacity. The bottom line is that if circuit breakers are triggered in any way, the *formal* and *recognizable* triggering would be much better than an *ad hoc*, *unexpected* one in a sense that the former makes people prepared and less frightened than the latter.

Then, the question narrows down to whether circuit breakers help facilitate price discovery in other situations. The answer to this question, although vague, depends on the beliefs about the effectiveness of market mechanisms. For example, the prices revealed in a market, even one highly stressed, may offer a better inducement for counterparts to assemble than do any reopening indications issued during the trading halt (Grossman, 1990). On the other hand, there may be a situation in which government intervention can bring about a better result as proponents of circuit breakers have asserted. The existence of circuit breakers can possibly prevent market breakdown by bolstering investors confidence and breaking the negative feedback loop caused by credit risks and the possibility of clearinghouse and bank failures. However, our findings indicate that circuit breakers are, on the average, more likely to impair the price discovery process than aid it. Moreover, inefficiencies such as not being able to complete mutually beneficial trades will further increase the cost of circuit breakers. Although this evidence does not conclusively refute the potential benefits of circuit breakers, it suggests the need for more careful formulation in instituting circuit breaker mechanisms so as to minimize their disadvantages.

## **Chapter 8.**

### **Summary and Concluding Remarks**

After Black Monday, concerns about market breakdowns have increased and the need for circuit breakers as a device to avoid extreme short-term stock market volatility has been taken for granted. As a consequence, major exchanges including the NYSE instituted several circuit breakers to halt or limit trading in times of market stress. However, it is not clear whether the existence of circuit breakers indeed stabilize price movements. Existing studies show mixed results.

This dissertation analyzed how the existence of circuit breakers affects price behavior. Using an auction-based asset market model, we showed that in the presence of circuit breakers, prices may overshoot their equilibrium level which could have been achieved in the absence of circuit breakers. Differential information about a shock is used as the basic motive for trading and the call auction method is employed as the trading mechanism. The reasoning underlying the above price overshooting phenomenon can be summarized as follows. When there is no limit on price movements, traders receive price information as a single point. The updated beliefs based on this price information do not affect the equilibrium price. However, when the market does not clear due to the existence of circuit breakers, people deduce that the equilibrium price is beyond the circuit breaker bound. This price information causes some traders to overreact to the underlying shock and submit more aggressive bids. Although the other rational traders recognize and exploit this irrational, aggressive bidding strategy, the market clearing price as a function of both traders' bidding



strategies overshoots the equilibrium value that would have been determined without circuit breakers.

We employed Korean stock market data to test whether the price overshooting hypothesis is empirically valid. Use of Korean stock market data brings a substantial advantage over other studies in the sense that it has a large number of the limit-triggered observations. Due to the narrowness of price limits, the proportion of the limit-triggered trading days amounts to about 13 percent during the sample period. The results showed that a significant negative (positive) bias in price movements are detected after the upper (lower) circuit breaker bound was triggered, suggesting that there is a substantial price overshooting. It was also found that price volatility is greater for the limit-triggered events compared to the events that price limits were not triggered. Together with price overshooting, the above evidence of increased volatility after the limit-triggered events suggests that the existence of circuit breakers aimed at facilitating the price discovery process may actually destabilize price movements.

Although our findings provide evidence against circuit breakers, they do not completely refute the presumed benefits of circuit breakers. For example, they can help reduce excess volatility in cases where price changes are caused by large supply shocks. They may also prevent possible negative externalities caused by a sudden, large price drop such as clearinghouse or bank failures. Besides, in a situation where capital markets are underdeveloped so that illegal insider trading is frequently committed and prices are easily manipulable by a few transactors, the existence of circuit breakers may be beneficial in preventing such manipulation by disseminating insider information to the public.

However, the existence of circuit breakers inevitably brings about inefficiencies into stock markets. They prevent traders from completing what they perceive to be

mutually beneficial trades. Moreover, when institution-induced price overshooting occurs, the existence of circuit breakers may cause inefficient outcomes without contributing to price stability. Although there may be particular situations where circuit breakers would be beneficial, it should be noted that they are blunt instruments which, once instituted, are triggered at a prespecified price change regardless of what causes the price to change.

The results presented in this dissertation suggest that we should be more cautious in accepting the presumed benefits of circuit breakers and should fairly assess their costs. If a decision is made to institute circuit breaker mechanisms, they should be designed so as to guarantee that they are triggered only if the potential benefits are considered to well exceed their costs. This study reveals one such possibility: circuit breakers as a substitute for *ad hoc, informal* market closings.