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# The influence of price limits on overreaction in emerging markets: Evidence from the Egyptian stock market

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ABSTRACT

The main objective of this paper is to investigate the influence of price limits on the overreaction hypothesis in the Egyptian Stock Exchange (EGX) during the period 1999–2010. I find evidence of the overreaction anomaly in the EGX within different price limit regimes. Price reversal is observed two and three days post lower and upper limit hits respectively within the strict price limits regime. However, it occurs after one day only for both lower and upper limit hits within the circuit breakers regime. These results support the directional effect hypothesis as large stock price movements are followed by price reversals in the opposite direction. Moreover, the results support the magnitude effect hypothesis as the larger the initial price movements the greater the subsequent reversals.



## 1. Introduction

Price limits are regulatory tools in both equity and futures markets in which further trading is prevented for a period of time with the intention of cooling market traders' emotions and reducing price volatility. The trigger for such limits is when prices hit particular pre-specified price boundaries[1]. Price limits have become very popular and are widely used by different stock exchanges over the world; however, their rules vary amongst the world's stock exchanges. There are two other categories of these regulatory tools, namely, firm-specific trading halts and circuit breakers (Kim & Yang, 2004; Phylaktis, Kavussanos, & Manalis, 1999). With firm-specific trading halts, trading is ceased for a given period of time within the session, or until the end of the trading session, for a particular stock(s) if prices hit the predetermined limit[2].

On the other hand, circuit breakers are regulatory tools that combine firm specific trading halts with price limits to cool down market volatility. Within the circuit breakers regime, trading also may be stopped – for a pre-specified duration – across the whole market if the market index hits a pre-determined level. The NYSE experience demonstrates that this is the most popular market-wide circuit breaker (Lee, Ready, & Seguin, 1994).

In efficient markets investors usually react to new information arriving in the market as a result of which, stock prices reach their equilibrium levels instantly. However, in less efficient markets i.e. emerging markets, information does not get disseminated to all investors at the same time. Therefore, when new information arrives in the market, investors tend to overreact or underreact; share prices then move (up or down) toward their equilibrium levels (Fama, 1989).

De Bondt and Thaler (1985) were the first to empirically examine the overreaction hypothesis in the finance literature. They built on the reasoning of Dreman (1982) and discovered a new stock market anomaly based on the Tversky and Kahneman's representativeness theory (1974). De Bondt and Thaler (1985) concluded that the market prices are predictable and deviate from

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[1] Price limits were first implemented in the Japanese rice futures market (the Dojima exchange) in the eighteenth century (see Chung and Gan, 2005). In 1917, price limits on cotton futures contracts were used in the US. The Chicago Board of Trade (CBOT) adopted this regulatory tool in 1925 (Kim & Yang, 2004).

[2] The history of the firm-specific trading halts started in 1934 when the Securities and Exchange Commission (SEC) was granted the power to suspend trading on particular shares in the organized market (Kim & Yang, 2004). The most popular example of firm-specific trading halts is that which operated in the NYSE where there are two main types of trading halts, namely, news and order imbalance trading halts (Kim & Yang, 2004Chan, Kim, & Rhee, 2005). The former comes into operation when the regulator expects that disseminated news will have an impact on prices, whereas the latter comes into operation when there are large discrepancies between buy and sell orders (Kim & Yang, 2004).

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their fundamental due to investors' overreactive behavior and this suggests a clear violation of the Weak Form market efficiency.

De Bondt and Thaler (1985) formulate two main testable hypotheses; the first hypothesis, "large stock price movements will be followed by price reversals in the opposite direction" (the directional effect of Brown & Harlow, 1988) and the second hypothesis, "the larger the initial price movements the greater the subsequent reversals" (the magnitude effect). This means that stock returns exhibit negative serial correlation over the longer horizon and therefore investors may earn abnormal returns by exploiting this long-term mispricing. This suggests a clear violation of market efficiency[3].

Imposing price limits on this theory may prevent speculative traders from overreacting to the information, and allows more time for investors to analyze this new information and to adjust their portfolios, particularly during the trading halt period until the trading session is resumed. Therefore price limits – in theory – should cool down market sentiment and reduce stock price volatility (Phylaktis et al., 1999; Chen, 1997; Kim & Rhee, 1997; Chan et al., 2005).

Despite the popularity of price limits, there is a remarkable debate in the literature regarding the effectiveness of such regulatory tools, and whether or not they actually reduce price volatility as intended (Phylaktis et al., 1999). Price limits may cause price volatility to spread out over a few days post limit hits (volatility spillover hypothesis); see for example, Fama (1989), Kim and Rhee (1997), Chen (1997), George and Hwang (1995) and Chen, Chiou, and Wu (2004). Moreover, it is argued that price limits prevent security prices from reaching their equilibrium levels due to the suspension of trading for a period of time (delayed price discovery hypothesis); see for example Fama (1989), Lehmann (1989), Lee et al. (1994), Kim and Rhee (1997), and Phylaktis et al. (1999).

Lee et al. (1994) argue that price limits interfere with the price discovery mechanism as trading usually ceases (when prices hit the limits) until the limits are revised. Therefore, at the limit-hit day these constraints i.e. limits prevent stock prices from reaching their equilibrium levels until the following trading day (session). Therefore, if price limits are activated, stocks often experience either price continuation or price reversal as the equilibrium price may fall inside or outside the daily limit range (Fama, 1989; Phylaktis et al., 1999).

Although there has been extensive literature on price limits, no other studies – to the best of my knowledge – have empirically investigated the influence of imposing alternative price limit regimes (circuit breakers/price limits) on the overreaction hypothesis. There are a few stock exchanges throughout the world that have imposed alternative price limits regimes and switched to wider limit bands e.g. Thailand from 10% to 30%, and the Korean Stock Exchange from 6% to 15%. However, the Egyptian Stock Exchange uniquely provides an example of the switch from strict (narrow) price limits (SPL) (±5%) to circuit breakers (CB) (firm specific trading halts combined with price limits). The switch is accompanied by a move to much wider price limits (±10–20%). Therefore, studying the Egyptian experience may add to the literature on price limits.

This paper – to the best of my knowledge – is the first to investigate the effect of imposing different regulatory regimes on the overreaction hypothesis. I find evidence of the overreaction anomaly in the EGX. Price reversal is observed two and three days post lower and upper limit hits respectively within the SPL regime. However, price reversal occurs after one day only within the CB regime. These results support the directional effect hypothesis of Brown and Harlow (1988); as large stock price movements are followed by price reversals in the opposite direction. Moreover, the results support the magnitude effect hypothesis as the larger the initial price movements the greater the subsequent reversals.

This paper provides clear evidence of stock market imperfection; therefore investors can earn abnormal returns by exploiting the overreaction anomaly. Exploring market imperfections works as an early warning system to the regulator in emerging markets. The rest of the paper is organized as follows. Section 2 presents a survey of the literature. Section 3 presents a brief background about EGX. Section 4 provides a brief description of the dataset and presents details of the econometric modeling. Section 5 reports the empirical results, and a final section summarizes and concludes.

## 2. Literature review

Huang, Fu, and Ke (2001) investigate the overreaction hypothesis in the Taiwanese stock market over the period 1990–1996. They find evidence to support the overreaction hypothesis as price continuation pattern is found in the overnight period following limit moves and price reversal behavior is reported in the subsequent trading days due to noise trading. Phylaktis et al. (1999) also find empirical evidence to support the overreaction hypothesis in the Athens stock exchange over the period 1990 to 1996.

Kim and Yang (2004) also investigate the the overreaction hypotheses in the Taiwanese Stock Exchange (TWSE). They find a dramatic decrease in price volatility following consecutive limit hits. Moreover, they find that price limits are unable to reduce information asymmetry in the TWSE. Kim and Rhee (1997) find evidence of price continuation as trading activity increased following the limit-hit day(s). Bildik and Gulay (2006) use the methodology of Kim and Rhee (1997) and find evidence of the trading interference hypotheses in Istanbul stock Exchange over the period 1998–2002.

Huang (1998) analyses the overreaction hypothesis following up and down limit moves for all the listed shares in the Taiwan stock exchange during the period 1971–1993. He finds highly significant price reversals following up and down limit moves; these reversals are not due to size effects. Diacogiannis, Patsalis, Tsangarakis, and Tsiritakis (2005) using the methodology of Huang (1998), find similar results in the Athens Stock Exchange (ASE). Chen et al. (2004) investigate the learning behavior of rational investors and the role of past information within the strict (7%) price limits regime in Taiwan over the period 1991–1998. They find evidence of price underreaction due to the delayed price discovery hypothesis within the price limits regime.

Kim and Limpaphayom (2000) look at the characteristics of shares that frequently hit the limits in Taiwan and Thailand stock exchanges over 1990–1993. They find that high volatility and trading volume are the main characteristics of shares that are likely to hit the limits. Chan et al. (2005) investigate the effect of imposing wider price limits (±30%) on the price discovery mechanism, information asymmetry and order imbalance in the Kuala Lumpur Stock Exchange (KLSE) over the period 1995–1996. They find no evidence that price limit enhances information asymmetry. They also find that price limits delay the information flow and lead to order imbalance. Kim (2001) finds similar results on the Taiwanese Stock Exchange (TWSE) and argues that the more the restricted bands of price limits the higher the volatility of stock returns. Nath (2005) investigates the effect of price limits on different groups of stocks listed in the National Stock Exchange (NSE) in India over the period 1999–2000. He concludes that price limits are found to be a

[3] De Bondt and Thaler (1985) find that past Losers outperform past Winners by 24.6% in the US, and therefore they recommend selling Winners short and buying Losers as a profitable strategy. They argue that the overreaction phenomenon causes past losers to be underpriced and past Winners to be overpriced. In addition, they find evidence that the overreaction effect is asymmetric and most of the cumulative average abnormal residuals (16.6%) are realized in January.

useful tool in captivating volatility for some individual shares but not for the entire Indian stock market.

In addition to price limits, firm-specific trading halts have been extensively investigated in the literature. Greenwald and Stein (1991) argue that trading halts provide a suitable time for the dissemination of information between brokers and traders, so that large price movements are expected post trading halts. Greenwald and Stein (1988) claim that large price movements are not a cause for concern as long as there is no information asymmetry between the traders and specialists. Kyle (1988) argues that trading halts reduce price volatility and cool the markets down as they allow investors to adjust their portfolios or to cancel their orders. Therefore – from the perspective of regulators – trading halts may protect investors from incurring heavy losses. Madura, Richie, and Tucker (2006) investigate the consequences of trading halts in the NASDAQ in 1998. They find significant abnormal returns pre trading halts period, however, they find no significant abnormal returns post trading halts.

On the other hand, Fama (1989) argues that trading halts historically failed to cool markets down and decrease price volatility. In contrast, volatility is found to be higher under such halts (Lee et al., 1994)[4]. Fama (1989) believes that all investors may implement their *own* trading halts if they wish to analyze the disseminated information; these are called "*homemade*" trading halts. Kim and Yang (2004) argue that trading halts may imply welfare loss for traders as they are unable to trade during the halts. Christie, Corwin, and Harris (2002) investigate the relationship between trading halts and the dissemination of information during the halt periods in the NASDAQ[5] over the period 1997–1998. They find that liquidity can be enhanced during the market closure as trading halts allow the dissemination of information and enable investors to adjust their portfolios. They also find highly significant increases in trading volume and stock price volatility during the 90 min quotation period in the following day (trading session).

Kim, Yague, and Yang (2008) find that both trading volume and volatility increase immediately after trading halts in the Spanish stock exchange over the period 1998–2001. However, liquidity tends to be higher within a trading halts regime compared to strict price limits. They argue that investors are willing to provide liquidity as the degree of information asymmetry is reduced by the release of the new information during trading halt periods. Kryzanowski and Nemiroff (1998) examine whether the relationship between price discovery and trading halts are stable over time during the period 1988–1989. They find that both volatility and trading volume tend to increase significantly over two days post trading halts.

## 3. Institutional background about EGX

The Egyptian Stock Exchange (EGX) achieved reasonable performance indicators during the financial crisis period[6]. The Economist classified the EGX in 2010 as one of the best six emerging markets (CIVETS)[7] offering significant potential growth. Moreover, the World Federation of Exchanges' (WFE) statistics in 2010 reported that the average gain achieved by EGX was 15%, ahead of many leading world emerging stock exchanges i.e. China, Brazil, and the Czech Republic. Whereas, Standard and Poor's S&P IFCI reported that the average growth rate for the EGX during 2010 was 13% compared with an average growth rate of 12% for other emerging markets.

EGX regulator has imposed two different price limits regimes namely strict price limits (SPL and circuit breakers (CB) (firm specific trading halts combined with price limits). Since 1996, strict (±5%) price limits (SPL) were imposed to all listed shares. The limit is activated for a particular stock only when stock prices hit the upper or lower limit, and then the trading on these shares is suspended to the end of the trading session. In 2002, the regulator adopted the CB regime in which price limits have winded to ±20% for the most actively traded shares in the EGX. Within the new CB regime, when a particular stock price hits ±10%, trading is halted for 30 min. During the halt period, brokers should inform their clients about the temporary suspension of the trading session. Moreover, they are allowed to cancel or adjust traders' positions. Trading is ceased until the end of the session only when prices hit their ceiling of ±20%.

**Table 1**
Summary statistics for the frequency of events 1999–2010.

| Year | Upper limit hits | | Lower limit hits | | Total no. of events |
|---|---|---|---|---|---|
| | +5% | +10% | −5% | −10% | |
| Total no. of events | 1655 | 771 | 1174 | 621 | 4221 |
| 1999 | 163 | 0 | 81 | 0 | 244 |
| 2000 | 170 | 0 | 94 | 0 | 264 |
| 2001 | 174 | 0 | 115 | 0 | 289 |
| 2002 | 187 | 14 | 127 | 18 | 346 |
| 2003 | 194 | 24 | 139 | 19 | 376 |
| 2004 | 208 | 30 | 143 | 22 | 403 |
| 2005 | 283 | 42 | 221 | 33 | 579 |
| 2006 | 164 | 117 | 152 | 83 | 516 |
| 2007 | 38 | 106 | 35 | 96 | 275 |
| 2008 | 31 | 138 | 29 | 104 | 302 |
| 2009 | 24 | 141 | 21 | 114 | 300 |
| 2010 | 18 | 159 | 17 | 132 | 326 |

## 4. Data and econometrics modeling

Daily stock prices and market capitalization data were collected for all listed companies[8] in the EGX over the period 1999–2010. I use the EGX30—a free-float market capitalization-weighted index as a benchmark. Table 1 summarizes the frequency of limit hit events over the period 1999–2010.

To investigate the overreaction hypothesis under price limits and/or circuit breakers, I adopt the event study methodology of Brown and Warner (1980) and Huang (1998)[9]. The return variable is defined as the first difference in the natural logarithm of the closing price (adjusted for dividends, stock split and stock dividends) over two consecutive trading days. I estimate the market model parameters $\alpha_i$ and $\beta_i$ over estimation window 125 days (−140, −16) as in Eq. (1). Other measures are also tried, namely the CAPM model and market adjusted model, but qualitatively the results remain the same. This is also in line with the literature (Cox & Peterson, 1994).

I define the event ($t = 0$) as when stock prices hit the upper or the lower limit in both regimes (SPL ±5%) and (CB ±10%)[10]. The

[4] They argue that the media coverage plays an important role in explaining the post halt price behavior due to the increase in the heterogeneity of investors' beliefs.

[5] In the NASDAQ there are two types of price discovery mechanisms associated with trading halts. One is the five-minute quotation period pre the resumption of trading. The second type is if a trading halt occurs after 4 pm. In this case, trading will reopen the following day (trading session) with 90 min trading quotation.

[6] Some institutional factors distinguish the Egyptian stock market from other emerging markets such as neither capital gain nor dividends are taxed.

[7] Colombia, Indonesia, Vietnam, Egypt, Turkey and South Africa.

[8] The number of listed companies varies over time and ranges from 180 to 251.

[9] I also used the event study methodology of Bremer and Sweeney (1991) and Cox and Peterson (1994), to estimate the abnormal returns using different estimation and test windows and obtained similar results.

[10] I have also used symmetric windows (symmetric number of years within each regime) and obtained very similar results.

Egyptian Stock Market is a thinly trading market so that to avoid the infrequent trading bias following Huang (1998), I exclude those shares that are not traded at least 80% of trading days during the estimation window.

$$R_{it} = \alpha_i - \beta_i R_{mt}, \qquad t = 0, 1, 2, \ldots, T \tag{1}$$

Following Huang (1998), the event window is −15, +15 and the security abnormal return in the post-event period has been estimated as in the following equation:

$$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}, \qquad t = 0, 1, 2, \ldots, T \tag{2}$$

**Table 2**
Descriptive statistics and the diagnostics tests for daily stock returns in EGX.

*Panel A*: Descriptive statistics

| | Mean | Max | Min | Std. Dev. | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| $R_{mt}$ | 0.05 | 8.612 | −10.54 | 1.812 | −0.671 | 9.05 |
| $CAAR_{it}$ | 2.373 | 3.804 | 0.107 | 1.342 | −0.423 | 1.501 |
| $AR_{it}$ | 0.115 | 0.548 | −0.259 | 0.173 | 0.335 | 3.009 |
| $AAR_{i0}$ | 0.548 | 11.328 | −8.636 | 8.891 | 0.214 | 1.521 |
| Ln mcap | 19.121 | 1.461 | 24.831 | 18.516 | 0.111 | 2.342 |
| $Leak_{it}$ | 7.019 | 16.081 | −1.298 | 7.376 | 0.153 | 1.743 |

*Panel B*: Diagnostic tests

| | ADF | KPSS | PP | Q(20) | Q2(20) | LM ARCH |
|---|---|---|---|---|---|---|
| $R_{mt}$ | −45.051*** | 0.327 | 38.32** | 177.17*** | 681.81*** | 150.78*** |
| $R_{mt}$SPL | −24.469*** | 0.214 | −28.25*** | 128.13*** | 414.00*** | 191.41*** |
| $R_{mt}$CB | 23.031*** | 0.142 | 22.97*** | 74.42** | 201.21** | 26.98** |

The Table reports the descriptive statistics for the EGX30 market index and the main variables used in the empirical analysis. $R_{mt}$ is the daily return on the EGX30 market index; $CAAR_{it}$ is the cumulative average abnormal returns over 31 day window; $AAR_{it}$ is the average abnormal returns over 31 day window; $AR_{i0}$ is the abnormal return on event day; Ln mcap is the natural log of the free floated market cap of company (i) one day before the event. $Leak_{it}$ is cumulative average abnormal returns for three days before event date as a proxy for the leakage of information. Panel B presents the tests for serial correlation (Box and Pierce), ARCH effects (Ljung–Box and Lagrange Multiplier), stationary (Augmented Dickey Fuller or ADF, Phillips–Perrone or PP and Kwiatkowski, Phillips, Schmidt and Shin or KPSS) for the EGX30 market index, SPL, and CB windows. SPL and CB refer to the strict price limits and circuit breaker windows respectively.
*** and ** Indicate significance at the 1%, 5% levels.

**Table 3**
Average abnormal returns for upper and lower limit hits within the Strict Price Limits regime.

| Days | Upper limit hits | | | | Lower limit hits | | | |
|---|---|---|---|---|---|---|---|---|
| | +5% | | | | −5% | | | |
| | AR(%) | CAR(%) | $t$(AR) | $t$(CAR) | AR(%) | CAR(%) | $t$(AR) | $t$(CAR) |
| −15 | −0.1337 | −0.1337 | −0.7053 | −0.7053 | −0.1466 | −0.1466 | −0.7416 | −0.7416 |
| −14 | 0.4708 | 0.3371 | 2.3759** | 1.1345 | 0.0436 | −0.1030 | 0.2238 | −0.3215 |
| −13 | −0.0091 | 0.3280 | −0.0476 | 0.9721 | 0.0247 | −0.0783 | 0.1620 | −0.2275 |
| −12 | −0.0403 | 0.2877 | −0.2522 | 0.6879 | 0.1019 | 0.0236 | 0.5391 | 0.0626 |
| −11 | −0.2779 | 0.0098 | −1.5355 | 0.0199 | 0.1778 | 0.2014 | 1.0985 | 0.4825 |
| −10 | 0.4274 | 0.4371 | 2.0443** | 0.7266 | 0.2186 | 0.4200 | 1.1556 | 0.8003 |
| −9 | 0.3331 | 0.7702 | 2.0270** | 1.1084 | 0.1235 | 0.5435 | 0.6470 | 0.9827 |
| −8 | −0.1745 | 0.5957 | −1.0198 | 0.7933 | 0.4712 | 1.0147 | 2.5957*** | 1.5929 |
| −7 | 0.2254 | 0.8212 | 0.9448 | 1.0718 | 0.1224 | 1.1371 | 0.7364 | 1.6877* |
| −6 | 0.1820 | 1.0031 | 0.8574 | 1.1912 | 0.1869 | 1.3240 | 0.9184 | 1.7804* |
| −5 | 0.1699 | 1.1730 | 0.6652 | 1.2834 | 0.3655 | 1.6895 | 1.6938* | 2.0334** |
| −4 | 0.1105 | 1.2835 | 0.5700 | 1.3923 | 0.4626 | 2.1521 | 2.0669** | 2.4037** |
| −3 | 0.1105 | 1.3941 | 0.5700 | 1.2337 | 0.4626 | 2.6147 | 2.0669** | 2.4243** |
| −2 | −0.1225 | 1.2716 | −0.4642 | 0.9835 | 0.5427 | 3.1574 | 2.3646** | 2.6531*** |
| −1 | 0.2801 | 1.5517 | 1.8423* | 1.7903* | 0.1087 | 3.2661 | 2.4301** | 2.4896** |
| **0** | **3.9534** | **5.5051** | **16.0287***** | **4.2220***** | **−4.4529** | **−1.1868** | **−26.737***** | **−2.7332***** |
| 1 | 0.1362 | 5.6413 | 0.3454 | 4.052*** | −0.3606 | −1.5474 | −0.5246 | −0.7338 |
| 2 | 0.6337 | 6.275 | 1.7307* | 3.3583*** | 0.1696 | −1.3778 | 1.6839* | −0.8564 |
| 3 | −0.2785 | 5.9965 | −1.9321* | 3.4481*** | 0.5106 | −0.8672 | 0.7667 | −0.5402 |
| 4 | 0.4493 | 6.4458 | 1.3325 | 3.6264*** | 0.8104 | −0.0568 | 1.7195* | −0.0612 |
| 5 | 0.4683 | 6.9141 | 1.7822* | 3.718*** | −0.4758 | −0.5326 | −2.0772** | −0.2555 |
| 6 | 0.0938 | 7.0079 | 0.315 | 3.619*** | −0.014 | −0.5466 | −0.0754 | −0.2593 |
| 7 | −0.2552 | 6.7527 | −0.9973 | 3.326*** | 0.7228 | 0.1762 | 1.1274 | 0.1783 |
| 8 | 0.1858 | 6.9385 | 0.7209 | 3.3392*** | −0.1532 | 0.023 | −0.8588 | 0.0934 |
| 9 | 0.1855 | 7.124 | 0.7789 | 3.3875*** | −0.2755 | −0.2525 | −1.252 | −0.0574 |
| 10 | 0.1091 | 7.2331 | 0.318 | 3.2987*** | −0.4219 | −0.6744 | −2.0937** | −0.2886 |
| 11 | 0.0062 | 7.2393 | 0.0217 | 3.2778*** | 0.1079 | −0.5665 | 0.5671 | −0.2285 |
| 12 | 0.4204 | 7.6597 | 1.7641* | 3.4827*** | −0.0441 | −0.6106 | −0.2445 | −0.2573 |
| 13 | 0.2426 | 7.9023 | 0.8959 | 3.5581*** | −0.2921 | −0.9027 | −1.3307 | −0.4106 |
| 14 | 0.3764 | 8.2787 | 1.4538 | 3.5337*** | 0.0475 | −0.8552 | 0.2305 | −0.3778 |
| 15 | 0.551 | 8.8297 | 2.5838*** | 3.6886*** | −0.2898 | −1.145 | −1.3161 | −0.5264 |

The Table presents the average abnormal returns and the cumulative average abnormal returns for the strict price limits (SPL) upper and lower limit hits (±5%).
***, **, * Indicate significance at the 1%, 5% and 10% levels.

where $T = 31$ days around event window (−15, +15), $\alpha_i$ and $\beta_i$ are the parameters of the market model for each company over the estimation window. I also use GARCH and TARCH models to estimate security abnormal returns following Benou and Richie (2003) and obtained similar results to those of OLS. $R_{it}$ and $R_{mt}$ are the returns on company (i) and the value weighted market index EGX30 respectively.

The daily average abnormal return ($AAR$) for a given day for ($n$) events and the cumulative average abnormal returns for the event window (−15, +15) are calculated as in Eqs. (3) and (4) following Huang (1998).

$$AAR_{it} = \frac{1}{n}\sum_{\tau-1}^{t} AR_{i\tau} \quad (3)$$

$$CAR_{it} = \sum_{\tau=1}^{t} AR_{i\tau} \quad (4)$$

To further develop the analysis, I examine the effect of firm size on the overreaction hypothesis following Huang (1998). Market capitalization (as a proxy for size) is calculated for each share based on the average daily market capitalization in the previous month ($t-1$). Firms included in the sample are ranked in an ascending order and grouped into five quintiles based on market capitalization of the previous month. This process is updated according to the monthly market capitalization rankings. Daily average abnormal returns have been calculated for two groups, namely, small and big based on the first and fifth quintile.

Finally, following Cox and Peterson (1994), Larson and Madura (2003), Farag and Cressy (2010) and Ma, Tang, and Hasan (2005), I estimate Eq. (5) for both upper and lower limits individually by regressing non-overlapping cumulative average abnormal returns $CAAR_i$ against initial abnormal returns in event day $AAR_{i0}$, firm size (natural log of the free float market capitalization one day before the event), and a dummy variable representing the regime in operation (SPL or CB). Moreover, I include $\text{Leak}_i$ variable (cumulative average abnormal returns for three days before the event date) that captures the leakage of information and the effect of insider information as a proxy for market inefficiency (Larson & Madura, 2003). I also control for the effect of the global financial crisis by including a dummy variable which takes the value of 1 if the event occurs during 2007–2010 and 0 otherwise.

$$CAAR_i = \mu + \beta_1 AAR_{i0} + \beta_2 \ln\ \text{mcap}_i + \beta_3\ \ \text{Leak}_i + \beta_4 \text{SPL}_i + \text{GFC}_i + \varepsilon_i \quad (5)$$

where $CAAR_i$ is the cumulative average abnormal returns for company (i) over the event window (140 days). $AAR_{i0}$ is average initial abnormal return for company (i) in event day $t = 0$. $\ln \text{mcap}_i$ is the natural log of the free floated market cap of company (i) one day before the event. $\text{Leak}_i$ is the cumulative average abnormal returns for three days before event date as a proxy for the leakage of information. $\text{SPL}_i$ is a dummy variable = 1 if the strict price limits regime is in operation and 0 otherwise. GFC is a dummy variable that takes the value of 1 if the event occurs during 2007–2010 and 0 otherwise. $\varepsilon_i$ is a white noise error term for stock (i).

**Table 4**
ARs and CARS for upper and lower limit hits within the CB regime.

| Days | Upper limit hits | | | | Lower limit hits | | | |
|---|---|---|---|---|---|---|---|---|
| | +10% | | | | −10% | | | |
| | AR(%) | CAR(%) | $t$(AR) | $t$(CAR) | AR(%) | CAR(%) | $t$(AR) | $t$(CAR) |
| −15 | −0.0352 | −0.0352 | −0.1146 | −0.1146 | 0.7467 | 0.7467 | 1.9948** | 1.9948** |
| −14 | −0.1875 | −0.2227 | −0.7146 | −0.8474 | 1.2343 | 1.9810 | 3.8296*** | 4.2844*** |
| −13 | −0.7487 | −0.9714 | −2.4672** | −1.3135 | 0.2616 | 2.2426 | 0.6871 | 3.3353*** |
| −12 | −0.0655 | −1.0369 | −0.2752 | −1.2489 | 0.0250 | 2.2676 | 0.0923 | 3.2370*** |
| −11 | −0.5312 | −1.5681 | −1.7723* | −1.5640 | 0.6578 | 2.9254 | 1.5807 | 2.7832*** |
| −10 | −0.3646 | −1.9327 | −1.1692 | −1.6915* | 0.5777 | 3.5031 | 1.3842 | 2.3340*** |
| −9 | 0.4298 | −1.5029 | 1.5179 | −1.0597 | 0.4586 | 3.9617 | 1.2985 | 2.6023*** |
| −8 | 0.0697 | −1.4332 | 0.3258 | −1.1228 | −0.0195 | 3.9422 | −0.0672 | 2.4284** |
| −7 | 0.3477 | −1.0855 | 1.0907 | −0.6605 | −0.4015 | 3.5407 | −1.3467 | 2.0850** |
| −6 | −0.1090 | −1.1945 | −0.4382 | −0.4560 | 0.0780 | 3.6187 | 0.2473 | 2.0273** |
| −5 | −0.1169 | −1.3114 | −0.3555 | −0.3608 | 0.7022 | 4.3209 | 2.0623 | 1.9820** |
| −4 | 0.3177 | −0.9937 | 0.9916 | 0.2769 | 0.4225 | 4.7434 | 1.1711 | 2.0687** |
| −3 | 0.3177 | −0.676 | 0.9916 | 0.5384 | 0.4225 | 5.1659 | 1.1711 | 2.2486** |
| −2 | 0.0627 | −0.6133 | 0.1490 | 0.9301 | 0.1050 | 5.2709 | 0.2430 | 2.5619** |
| −1 | 0.6043 | −0.009 | 1.9668** | 1.1639 | 0.3731 | 5.644 | 1.0595 | 2.6258*** |
| **0** | **11.3280** | **11.319** | **30.6179*** ** | **7.3844*** ** | **−8.6362** | **−2.9922** | **−21.384*** ** | **−2.9432*** ** |
| 1 | −0.5768 | 10.7422 | −1.9159* | 7.0178*** | 1.6122 | −1.38 | 2.9928*** | −1.9197* |
| 2 | −0.1945 | 10.5477 | −0.3465 | 6.2229*** | −0.6983 | −2.0783 | −1.9257* | −1.0556 |
| 3 | 0.6262 | 11.1739 | 1.4070 | 6.0432*** | −0.0692 | −2.1475 | −0.1643 | −1.1549 |
| 4 | −0.0290 | 11.1449 | −0.0701 | 5.7334*** | −0.9047 | −3.0522 | −1.3984 | −1.4125 |
| 5 | 0.0026 | 11.1475 | 0.0053 | 5.1626*** | 0.6204 | −2.4318 | 1.0971 | −0.6703 |
| 6 | −0.1624 | 10.9851 | −0.3823 | 5.0544*** | 0.0002 | −2.4316 | 0.0007 | −0.4215 |
| 7 | 0.2800 | 11.2651 | 0.5203 | 4.6873*** | −0.5460 | −2.9776 | −1.7603* | −0.7332 |
| 8 | 0.2905 | 11.5556 | 0.6901 | 4.6616*** | −1.3613 | −4.3389 | −1.7523* | −1.1866 |
| 9 | 1.0686 | 12.6242 | 1.9663** | 4.5480*** | −0.4132 | −4.7521 | −0.6104 | −1.2211 |
| 10 | −0.2191 | 12.4051 | −0.5495 | 4.3324*** | 0.0724 | −4.6797 | 0.1247 | −1.3032 |
| 11 | −0.1317 | 12.2734 | −0.3226 | 4.1756*** | −0.0407 | −4.7204 | −0.0837 | −1.3312 |
| 12 | 0.1090 | 12.3824 | 0.2530 | 4.7106*** | −0.2387 | −4.9591 | −0.5701 | −1.1091 |
| 13 | 0.2646 | 12.647 | 0.6042 | 4.9524*** | −0.2259 | −5.685 | −0.5191 | −1.2902 |
| 14 | −0.2947 | 12.3523 | −0.7927 | 4.7403*** | −0.4727 | −6.1577 | −1.3298 | −1.3675 |
| 15 | 0.0048 | 12.3571 | 0.0135 | 4.7940*** | −0.0682 | −6.2259 | −0.1595 | −1.3481 |

The Table presents the average abnormal returns and the cumulative average abnormal returns for the ±10% upper and lower limit hits.
***, **, * Indicate significance at the 1%, 5% and 10% levels.

**Table 5**
Average abnormal returns for the upper limit hits for Big and small portfolios within SPL regime.

| Days | Upper limit hits +5% | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Panel A*: small portfolios | | | | *Panel B*: big portfolios | | | |
| | AR(%) | CAR(%) | t(AR) | t(CAR) | AR(%) | CAR(%) | t(AR) | t(CAR) |
| −15 | −0.3628 | −0.3628 | −0.9109 | −0.9109 | 0.1285 | 0.1285 | 0.4165 | 0.4165 |
| −14 | 1.1477 | 0.7849 | 2.6569*** | 1.5510 | 0.3629 | 0.4914 | 1.4986 | 1.8737* |
| −13 | −0.7191 | 0.0658 | −1.6397* | 0.1611 | 0.2636 | 0.755 | 1.4876 | 2.3366** |
| −12 | 0.5414 | 0.6072 | 1.9375* | 1.1319 | −0.2198 | 0.5352 | −1.0585 | 1.2286 |
| −11 | −0.7107 | −0.1035 | −1.4020 | −0.1628 | 0.0365 | 0.5717 | 0.1285 | 1.0401 |
| −10 | 0.8820 | 0.7785 | 1.9968** | 0.9402 | 0.3271 | 0.8988 | 1.0941 | 1.4539 |
| −9 | 0.6619 | 1.4404 | 1.7361* | 1.3823 | 0.2668 | 1.1656 | 1.0184 | 1.5516 |
| −8 | −0.2919 | 1.1485 | −0.8285 | 1.0858 | 0.1483 | 1.3139 | 0.8344 | 1.5656 |
| −7 | 0.2745 | 1.423 | 0.4719 | 1.2900 | 0.4210 | 1.7349 | 1.5200 | 1.3301 |
| −6 | −0.7047 | 0.7183 | −1.9739** | 0.6218 | 0.0268 | 1.7617 | 0.1200 | 1.3558 |
| −5 | 0.1271 | 0.8454 | 0.1583 | 0.4836 | 0.0858 | 1.8475 | 0.2709 | 2.3573** |
| −4 | 0.2510 | 1.0964 | 0.6533 | 0.5566 | −0.1743 | 1.6732 | −0.9536 | 1.9856** |
| −3 | 0.2510 | 1.3474 | 0.6533 | 0.4151 | −0.1743 | 1.4989 | −0.9536 | 2.2870** |
| −2 | −0.3751 | 0.9723 | −0.5475 | 0.2103 | 0.2724 | 1.7713 | 1.9596** | 2.0891** |
| −1 | 0.0678 | 1.0401 | 0.0978 | 0.1977 | 0.3615 | 2.1328 | 1.9604** | 2.2447** |
| **0** | **3.8801** | **4.9202** | **6.1000*** ** | **2.9372*** ** | **3.7326** | **5.8654** | **13.3678*** ** | **5.3084*** ** |
| 1 | 0.0778 | 4.998 | 0.0583* | 1.2906 | 0.1048 | 5.9702 | 0.1755 | 4.434*** |
| 2 | 0.7752 | 5.7732 | 0.7695 | 1.0854 | −1.2117 | 4.7585 | −2.4622** | 3.2049*** |
| 3 | −0.3761 | 5.3971 | −0.4428 | 1.1963 | 0.4813 | 5.2398 | 0.894 | 3.7437*** |
| 4 | 0.3922 | 5.7893 | 0.4325 | 1.3891 | 0.2277 | 5.4675 | 0.4061 | 3.3547*** |
| 5 | 1.0838 | 6.8731 | 1.9944** | 1.5849 | −0.0854 | 5.3821 | −0.1715 | 3.1556*** |
| 6 | 1.4037 | 8.2768 | 2.0287** | 1.8153* | −0.4670 | 4.9151 | −1.1201 | 2.7652*** |
| 7 | −0.4326 | 7.8442 | −0.7240 | 1.6311 | −0.5090 | 4.4061 | −1.3056 | 2.5228** |
| 8 | −0.6800 | 7.1642 | −0.8938 | 1.5577 | −0.2555 | 4.1506 | −0.7500 | 2.4402** |
| 9 | 0.1946 | 7.3588 | 0.2943 | 1.6454* | 0.9579 | 5.1085 | 2.8107*** | 2.7367*** |
| 10 | 0.6032 | 7.962 | 0.9669 | 1.8512* | 0.3398 | 5.4483 | 0.6603 | 3.0451*** |
| 11 | 0.8317 | 8.7937 | 1.0101 | 1.8084* | −0.1059 | 5.3424 | −0.2685 | 3.3089*** |
| 12 | −0.2078 | 8.5859 | −0.3158 | 1.6886* | 0.6081 | 5.9505 | 1.7028 | 3.6141*** |
| 13 | 0.9613 | 9.5472 | 1.5074 | 1.8712* | −0.0209 | 5.9296 | −0.0863 | 3.6537*** |
| 14 | 0.8263 | 10.3735 | 1.5167 | 1.8924* | −0.0017 | 5.9279 | −0.005 | 3.9516*** |
| 15 | 0.6163 | 10.9898 | 1.2618 | 1.9369* | 0.3798 | 6.3077 | 0.8430 | 4.2100*** |

The table presents the average abnormal returns and the cumulative average abnormal returns for the (+5%) upper limit hits (good news) for small and big portfolios in Panels A and B, respectively.
***, **, * Indicate significance at the 1%, 5% and 10% levels.

## 5. Empirical results

### 5.1. Descriptive statistics and diagnostic tests

Table 2 presents the descriptive statistics for the main variables used in the empirical analysis and the diagnostics tests for the EGX30 index and two subsamples namely SPL and CB respectively. The results presented in Table 2 show that the average returns ($R_{mt}$) for the EGX30 index is positive 0.05%. The cumulative average abnormal return ($CAAR_{it}$) is 2.37% over the event window (31 days), however, the average abnormal return ($AAR_{it}$) is 0.115%. The initial one-day abnormal return on event day ($AR_{i0}$) ranges from −8.64% to 11.32% over the event window with mean and standard deviation 0.548% and 8.89% respectively. The cumulative average abnormal returns three days before the event ($Leak_{it}$) – as a proxy for the leakage of information – is 7.02%, with 7.37% standard deviation over the event window. Finally, the average firm size is proxied by market capitalization of 202.4 million Egyptian pounds.

*Panel B* presents the diagnostic tests for the market return ($R_{mt}$) for the EGX30, SPL and CB windows respectively. The $Q_{20}$ Box and Pierce test for serial correlation on the first 20 lags of standardized residuals reject the null that stock returns are serially uncorrelated. The Ljung–Box and LMARCH tests reject the null that there is no ARCH effect. The KPSS test for stationarity with lag length determined by the Newey–West bandwidth test) does not reject the null that stock returns are stationary. The ADF and PP tests with lag length determined by Akaike Information Criterion (AIC) reject the null hypothesis that stock returns are nonstationary.

### 5.2. The overreaction hypothesis

Table 3 presents the average abnormal returns and the cumulative average abnormal returns for the upper and lower SPL (±5%). Table 3 shows that the average abnormal returns for the upper limits on event day is positive (3.95%) and highly significant, meanwhile the average abnormal returns for the lower limits on event day is negative (4.45%) and highly significant as well. Price reversals occur on the third day subsequent to upper limit hits ($t = -1.93$) and on the second day for the lower limit hits ($t = 1.68$). A possible explanation for this phenomenon is the delayed price discovery hypothesis. According to the delayed price discovery hypothesis, strict price limits delay or prevent stock prices from reaching their equilibrium levels for a few days post event as trading is suspended until the end of trading session when prices hit the limits. Therefore, the effect of the limit hits continues in the following day(s) post event.

Moreover, we find a positive and marginally significant abnormal returns (+.28%) one day pre upper limit hits. This suggests that upper limit hits might be predictable one day pre event. As for the lower limit hits, Table 3 reports significant and positive abnormal returns five days pre event. This suggests that lower limit hits might not be predictable under the SPL regime. The positive and significant abnormal returns five days pre event may imply investor optimism and herding behavior[11].

[11] If there is a leakage of information effect we would expect a negative and significant abnormal returns pre event.

**Table 6**
Average abnormal returns for the lower limit hits for Big and small portfolios within SPL regime.

| Days | Lower limit hits −5% | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Panel A*: small portfolios | | | | *Panel B*: big portfolios | | | |
| | AR(%) | CAR(%) | t(AR) | t(CAR) | AR(%) | CAR(%) | t(AR) | t(CAR) |
| −15 | 0.3520 | 0.3520 | 0.6964 | 0.6964 | −0.2510 | −0.2510 | −0.6794 | −0.6794 |
| −14 | −0.0243 | 0.3278 | −0.0600 | 0.4210 | 0.1595 | −0.0915 | 0.4657 | −0.1547 |
| −13 | 0.1485 | 0.4763 | 0.5712 | 0.6308 | −0.3701 | −0.4616 | −1.1573 | −0.8320 |
| −12 | −0.1330 | 0.3432 | −0.4052 | 0.3833 | −0.0729 | −0.5345 | −0.1947 | −0.6543 |
| −11 | 0.1058 | 0.4491 | 0.5046 | 0.4441 | 0.1909 | −0.3436 | 1.0285 | −0.3812 |
| −10 | 0.9216 | 1.3706 | 2.1811** | 1.0331 | −0.0899 | −0.4335 | −0.2389 | −0.4252 |
| −9 | −0.2312 | 1.1394 | −0.4048 | 0.7610 | 0.2933 | −0.1402 | 1.0392 | −0.1205 |
| −8 | 0.6140 | 1.7533 | 1.1886 | 0.9167 | 0.2425 | 0.1023 | 0.6663 | 0.0870 |
| −7 | 0.2348 | 1.9882 | 0.7034 | 1.0167 | 0.0601 | 0.1624 | 0.1439 | 0.1110 |
| −6 | 0.1290 | 2.1172 | 0.2511 | 0.9107 | −0.1922 | −0.0298 | −0.5011 | −0.0234 |
| −5 | −0.0703 | 2.0469 | −0.1680 | 0.8068 | 0.1234 | 0.0936 | 0.2269 | 0.0754 |
| −4 | 0.1268 | 2.1737 | 0.2704 | 0.8246 | 0.4688 | 0.5624 | 1.0389 | 0.4067 |
| −3 | 0.1268 | 2.3005 | 0.2704 | 0.8908 | 0.4688 | 1.0312 | 1.0389 | 0.0257 |
| −2 | 0.9282 | 3.2287 | 2.0186** | 1.0771 | 0.2310 | 1.2622 | 0.3852 | 0.1848 |
| −1 | 0.4986 | 3.7273 | 0.9355 | 1.1235 | −0.1157 | 1.1465 | −0.2225 | 0.0933 |
| **0** | **−4.3080** | **−0.5807** | **−10.2560*****| **−0.1036** | **−4.9465** | **−3.8** | **−22.048***** | **−2.7439***** |
| 1 | −0.7945 | −1.3752 | −1.6235* | −0.3095 | −0.7171 | **−3.8** | 1.1773 | −2.2732** |
| 2 | −0.9835 | −2.3587 | −2.2162** | −0.5835 | 0.0376 | −4.5171 | −0.0614 | −2.4389** |
| 3 | 2.6901 | 0.3314 | 1.9817** | 0.2217 | −0.5376 | −4.4795 | −1.3276 | −2.8949*** |
| 4 | 2.8364 | 3.1678 | 1.9825** | 0.9592 | −0.2411 | −5.0171 | −0.8844 | −2.8865*** |
| 5 | −0.9755 | 2.1923 | −1.9136* | 0.7427 | 0.4912 | −5.2582 | 1.1370 | −2.6105*** |
| 6 | 0.2461 | 2.4384 | 0.6696 | 0.8276 | −0.0559 | −4.767 | −0.1248 | −2.4556** |
| 7 | 2.1338 | 4.5722 | 0.8127 | 0.9084 | 0.0070 | −4.8229 | 0.0193 | −2.5287 |
| 8 | −0.2399 | 4.3323 | −0.5887 | 0.8640 | 0.1656 | −4.8159 | 0.4210 | −2.4596** |
| 9 | −0.8771 | 3.4552 | −1.5489 | 0.7450 | 0.0178 | −4.6503 | 0.0500 | −2.4672** |
| 10 | −0.4041 | 3.0511 | −0.9203 | 0.6715 | −0.2660 | −4.6325 | −0.6671 | −2.7143*** |
| 11 | 0.1545 | 3.2056 | 0.4715 | 0.7001 | −0.8966 | −4.8985 | −2.6559*** | −3.5623*** |
| 12 | 0.0002 | 3.2058 | 0.0005 | 0.7375 | 0.3842 | −5.7951 | 0.9133 | −2.7968*** |
| 13 | 0.3077 | 3.5135 | 0.7227 | 0.7928 | −0.0889 | −5.4109 | −0.1721 | −2.3969** |
| 14 | 0.2926 | 3.8061 | 0.5418 | 0.8557 | 0.0313 | −5.4998 | 0.0614 | −2.4342** |
| 15 | −0.8617 | 2.9444 | −2.5813*** | 0.6938 | −0.4662 | −5.4685 | −1.4975 | −2.7522*** |

The table presents the average abnormal returns and the cumulative average abnormal returns for the strict (−5%) lower limit hits (bad news) for small and big portfolios in Panels A and B, respectively.
***, **, * Indicate significance at the 1%, 5% and 10% levels.

Table 4 presents the average abnormal returns and the cumulative average abnormal returns for the CB regime. Table 4 shows that the average abnormal returns for the upper and lower limits on event day are +11.32% and −8.63% respectively and both are highly significant. Price reversal occurs on day one following the upper and lower limit hits ($t = -1.92$ and 2.99, respectively); however, the latter is highly significant. Table 4 also shows that the abnormal return for the upper limit hits on day one pre-event is significant, (positive abnormal returns are found four days pre-event). This suggests that upper limit hits might be predictable one day pre event within the CB regime. As for the lower limit hits, Table 4 reports a positive but insignificant abnormal returns six days pre the event, which suggests that lower limits might not be predictable under the CB regime.

The results presented in Tables 3 and 4 show that the price reversal pattern is observed two and three days post lower and upper limit hits respectively within the SPL regime. However, price reversal occurs one day post lower and upper limit hits within the CB regime. These results support the directional effect hypothesis of Brown and Harlow (1988); as large stock price movements are followed by price reversals in the opposite direction. Moreover, the results support the the magnitude effect hypothesis as the larger the initial price movements the greater the subsequent reversals. I interpret these results in line with the delayed price discovery hypotheses. To sum up, the above results support the overreaction hypothesis in the EGX. Fig. 1 shows the cumulative average abnormal returns for the upper and lower limit hits over the event window for the two regimes.

### 5.3. *The quintile size portfolios*

To investigate the effect of firm size on the overreaction hypothesis under different regulatory regimes, Table 5 presents the average abnormal returns and the cumulative average abnormal returns for small and big portfolios within the SPL regime as in *Panels A* and *B* respectively. The results presented in *Panel A* show that there is a price continuation behavior for small portfolios for two days following event day (upper limit hits). We also find a positive and marginally significant abnormal returns one day following the

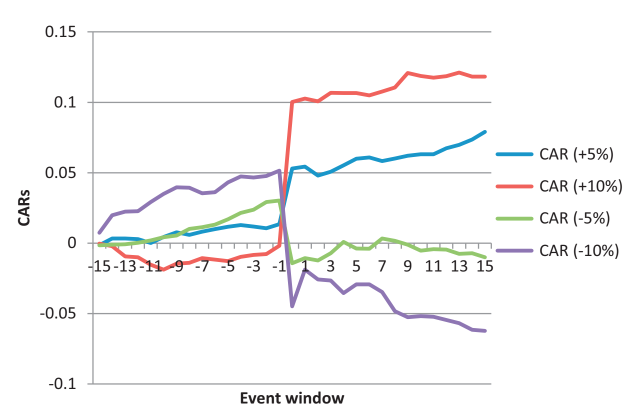


**Fig. 1.** Cumulative average abnormal returns (*CAARs*) for the upper and lower price limit hits over the event window for the two regimes.

**Table 7**
Average abnormal returns for the upper limit hits for Big and Small portfolios within CB regime.

| Upper limit hits +10% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Days | *Panel A*: Small portfolios | | | | *Panel B*: Big portfolios | | | |
| | AR(%) | CAR(%) | t(AR) | t(CAR) | AR(%) | CAR(%) | t(AR) | t(CAR) |
| −15 | 0.0230 | 0.0230 | 0.0189 | 0.0189 | 0.2203 | 0.2203 | 0.4366 | 0.4366 |
| −14 | 0.3370 | 0.3600 | 0.6734 | 0.2334 | −0.8836 | −0.6633 | −2.5796*** | −0.9326 |
| −13 | −1.6317 | −1.2717 | −3.9772*** | −0.9564 | 0.3462 | −0.3171 | 0.7803 | −0.3943 |
| −12 | 0.7860 | −0.4857 | 1.7593* | −0.4379 | −0.3317 | −0.6488 | −0.6099 | −0.6411 |
| −11 | −1.0335 | −1.5192 | −2.0605** | −1.2686 | −0.2290 | −0.8778 | −0.4606 | −0.6437 |
| −10 | 0.2641 | −1.2551 | 0.3938 | −0.7754 | −0.0334 | −0.9112 | −0.0673 | −0.5798 |
| −9 | 0.8586 | −0.3965 | 1.9247* | −0.2375 | 0.5631 | −0.3481 | 1.2414 | −0.1923 |
| −8 | 0.3144 | −0.0821 | 0.6263 | −0.0449 | 0.8693 | 0.5212 | 2.4041** | 0.2675 |
| −7 | −0.0042 | −0.0863 | −0.0105 | −0.0465 | 0.1585 | 0.6797 | 0.3907 | 0.3476 |
| −6 | −0.2591 | −0.3454 | −0.5209 | −0.1649 | 0.3124 | 0.9921 | 0.6129 | 0.4647 |
| −5 | −0.2184 | −0.5638 | −0.5331 | −0.2681 | −0.7859 | 0.2062 | −1.1043 | 0.1105 |
| −4 | −0.8265 | −1.3903 | −1.2501 | −0.5995 | 1.3715 | 1.5777 | 2.2880** | 0.7740 |
| −3 | −0.8265 | −2.2168 | −1.2501 | −0.5277 | 1.3715 | 2.9492 | 2.2880** | 0.9423 |
| −2 | −0.2851 | −2.5019 | −0.2861 | −0.5202 | 0.8154 | 3.7646 | 1.0346 | 1.0771 |
| −1 | 2.0326 | −0.4693 | 2.1044** | 0.1159 | −1.3659 | 2.3987 | −1.0650 | 0.4591 |
| **0** | **11.9821** | **11.5128** | **21.1858*** ** | **3.6754*** ** | **10.1940** | **12.5927** | **11.2760*** ** | **3.6214*** ** |
| 1 | −3.9895 | 7.5233 | −4.8058*** | 2.3055** | −0.9499 | 11.6428 | −0.8447 | 3.3666*** |
| 2 | 0.9464 | 8.4697 | 0.6173 | 2.3764** | −0.1755 | 11.4673 | −0.1717 | 3.0765*** |
| 3 | −0.0105 | 8.4592 | −0.0158 | 2.4136** | −0.3207 | 11.1466 | −0.5933 | 2.8026*** |
| 4 | 0.9056 | 9.3648 | 0.7328 | 2.6762*** | −0.2861 | 10.8605 | −0.4533 | 2.8377*** |
| 5 | 3.2954 | 12.6602 | 1.8201 | 2.9140*** | 0.1720 | 11.0325 | 0.2277 | 2.7993*** |
| 6 | −1.5100 | 11.1502 | −1.2351 | 2.4623** | 0.4639 | 11.4964 | 0.5073 | 2.6286*** |
| 7 | 2.2880 | 13.4382 | 0.9667 | 2.3354** | 0.6128 | 12.1092 | 0.7652 | 2.8261*** |
| 8 | −0.3055 | 13.1327 | −0.4681 | 2.4765** | −0.5101 | 11.5991 | −0.7909 | 2.6929*** |
| 9 | 2.8493 | 15.982 | 1.5158 | 2.3437** | −1.1072 | 10.4919 | −1.5432 | 2.3683** |
| 10 | 1.2279 | 17.2099 | 1.0446 | 2.2890** | 0.1206 | 10.6125 | 0.1915 | 2.5123** |
| 11 | 0.3237 | 17.5336 | 0.4907 | 2.3531** | −1.6492 | 8.9633 | −1.8445 | 1.9064* |
| 12 | −2.2213 | 15.3123 | −1.6006 | 2.4211** | 0.5156 | 9.4789 | 0.5108 | 2.3353** |
| 13 | −0.2452 | 15.0671 | −0.3736 | 2.2961** | −0.1473 | 9.3316 | −0.2412 | 2.2837** |
| 14 | −0.9861 | 14.081 | −1.4756 | 2.2416** | −0.8235 | 8.5081 | −1.3231 | 1.8705* |
| 15 | −0.3968 | 13.6842 | −0.4544 | 2.3859** | −0.3389 | 8.1692 | −0.4192 | 1.8312* |

The Table presents the average abnormal returns and the cumulative average abnormal returns for Small and Big portfolios within the circuit breakers upper (10%) limit hits.
***, **, * Indicate significance at the 1%, 5% and 10% levels.

event. Price reversals occur on day three post event. These results are consistent with Huang (1998).

The results reported in *Panel B* show that price reversal for big portfolios occurs on the second day following the event. The leakage of information is clear for big portfolios as significant and positive cumulative abnormal returns are observed two days pre limit hits. A possible interpretation of this result is that the vast majority of investors are actively involved in analyzing the news of big firms.

Table 6 presents the average abnormal returns and the cumulative average abnormal returns for small and big portfolios within the lower SPL regime as in *Panels A* and *B* respectively. The results presented in *Panel A* report that price reversal for small portfolios occurs on the third day following the event (lower limit hits) as we also notice a positive and significant abnormal returns on days three and four post event. On the other hand, price reversal for big portfolios occurs on the second day following the event. The leakage of information is not clear for both small and big portfolios.

Fig. 2 plots the cumulative averages abnormal returns for the upper and lower limits within the SPL regime for big and small portfolios. It is clear from Fig. 2 that price reversals are prevalent for small companies in case of lower SPL regime (−5%). This result supports the small firm effect and can be explained, as

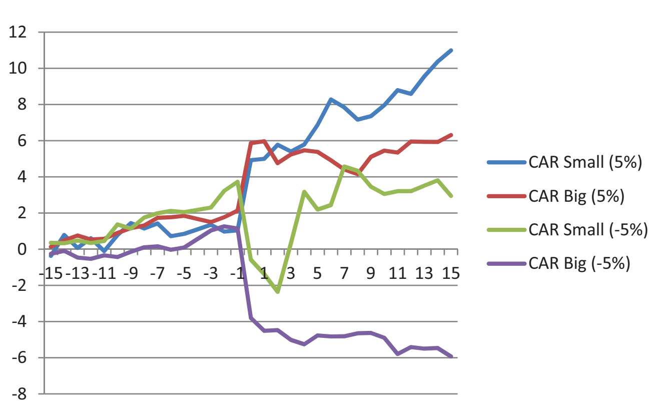


**Fig. 2.** Cumulative averages abnormal returns for big and small portfolios for the upper and lower limit hits within SPL regime.

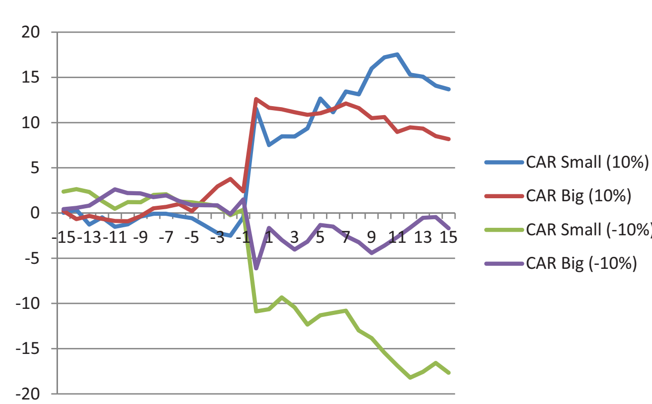


**Fig. 3.** Cumulative averages abnormal returns over the event window for the big and small portfolios within the CB regime.

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**Table 8**
Average abnormal returns for the upper and lower limit hits for Big and Small portfolios within CB regime.

| Lower limit hits −10% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Days | *Panel A*: Small portfolios | | | | *Panel B*: Big portfolios | | | |
| | AR(%) | CAR(%) | *t*(AR) | *t*(CAR) | AR(%) | CAR(%) | *t*(AR) | *t*(CAR) |
| −15 | 2.3637 | 2.3637 | 1.3984 | 1.3984 | 0.4387 | 0.4387 | 0.8998 | 0.8998 |
| −14 | 0.2721 | 2.6358 | 0.4462 | 1.3198 | 0.1276 | 0.5663 | 0.3126 | 1.0189 |
| −13 | −0.3024 | 2.3334 | −0.4000 | 1.3910 | 0.2504 | 0.8167 | 0.3876 | 0.7924 |
| −12 | −1.0080 | 1.3254 | −1.4911 | 0.6828 | 0.8922 | 1.7089 | 1.9430* | 1.4483 |
| −11 | −0.8538 | 0.4716 | −1.0516 | 0.2010 | 0.9058 | 2.6147 | 1.8833* | 2.1399** |
| −10 | 0.7254 | 1.197 | 0.4910 | 0.3944 | −0.4132 | 2.2015 | −1.5097 | 1.9101* |
| −9 | −0.0102 | 1.1868 | −0.0085 | 0.3256 | −0.0339 | 2.1676 | −0.0804 | 1.9666** |
| −8 | 0.8040 | 1.9908 | 0.9015 | 0.5127 | −0.4043 | 1.7633 | −1.5907 | 1.4895 |
| −7 | 0.0789 | 2.0697 | 0.0674 | 0.5385 | 0.1785 | 1.9418 | 0.4517 | 1.4396 |
| −6 | −0.7880 | 1.2817 | −0.6720 | 0.3260 | −0.6130 | 1.3288 | −1.0243 | 0.8624 |
| −5 | −0.0874 | 1.1943 | −0.1089 | 0.2878 | −0.4531 | 0.8757 | −1.0928 | 0.5774 |
| −4 | −0.2045 | 0.9898 | −0.2792 | 0.2227 | −0.0153 | 0.8604 | −0.0280 | 0.5701 |
| −3 | −0.2045 | 0.7853 | −0.2792 | 0.3253 | −0.0153 | 0.8451 | −0.0280 | 0.1797 |
| −2 | −1.0182 | −0.2329 | −0.9959 | 0.1102 | −0.9721 | −0.127 | −1.4695 | −0.3702 |
| −1 | 0.5944 | 0.3615 | 0.3527 | 0.2299 | 1.6311 | 1.5041 | 2.7069*** | 0.4790 |
| **0** | **−11.2329** | **−10.8714** | **−8.9462***** | **−2.1427**** | **−7.6231** | **−6.119** | **−6.3750***** | **−2.8245***** |
| 1 | 0.2354 | −10.636 | 0.2371 | −1.8729* | 4.4624 | −1.6566 | 3.8610*** | −0.7539 |
| 2 | 1.3024 | −9.3336 | 0.8968 | −1.6109 | −1.3305 | −2.9871 | −1.7616* | −1.3486 |
| 3 | −1.0993 | −10.4329 | −1.2649 | −1.9779** | −1.0512 | −4.0383 | −1.3126 | −1.7083* |
| 4 | −1.9053 | −12.3382 | −1.5797 | −2.1336** | 0.8758 | −3.1625 | 1.4234 | −1.4249 |
| 5 | 1.0256 | −11.3126 | 1.0104 | −2.0436** | 1.8371 | −1.3254 | 2.9406*** | −0.6304 |
| 6 | 0.2712 | −11.0414 | 0.3895 | −2.1216** | −0.1722 | −1.4976 | −0.4245 | −0.7125 |
| 7 | 0.2394 | −10.802 | 0.4581 | −2.0873** | −1.0398 | −2.5374 | −1.9040* | −1.0431 |
| 8 | −2.1925 | −12.9945 | −1.2813 | −2.1864** | −0.6933 | −3.2307 | −0.7307 | −1.2956 |
| 9 | −0.8417 | −13.8362 | −0.9092 | −2.2535** | −1.1947 | −4.4254 | −1.9592** | −1.7038* |
| 10 | −1.6071 | −15.4433 | −1.8575* | −2.5001** | 0.8214 | −3.604 | 1.0468 | −1.2910 |
| 11 | −1.4261 | −16.8694 | −1.8654* | −2.8093*** | 0.9363 | −2.6677 | 1.1676 | −0.9404 |
| 12 | −1.3349 | −18.2043 | −1.1400 | −3.0846*** | 1.0451 | −1.6226 | 1.5368 | −0.6068 |
| 13 | 0.6416 | −17.5627 | 0.4889 | −2.8946*** | 1.0910 | −0.5316 | 1.4690 | −0.2913 |
| 14 | 0.9747 | −16.588 | 1.2816 | −2.6729*** | 0.0852 | −0.4464 | 0.1975 | −0.2620 |
| 15 | −1.0714 | −17.6594 | −1.2455 | −2.7000*** | −1.2359 | −1.6823 | −1.3426 | −0.6072 |

The Table presents the average abnormal returns and the cumulative average abnormal returns for Small and Big portfolios within the circuit breakers lower (−10%) limit hits.
***, **, * Indicate significance at the 1%, 5% and 10% levels.

volatility is more likely to be higher for small companies (Huang, 1998).

Tables 7 and 8 present the average abnormal returns and the cumulative average abnormal returns for small and big portfolios within the upper and lower limits of the CB regime respectively. We find that price reversals occur one day following the limit hits day for both big and small portfolios. Moreover, we find a significant abnormal return one day pre-upper limit hits for small portfolios.

The results presented in Tables 7 and 8 do not support the effect of size on the overreaction hypothesis within the CB regime as price reversals occur one day following the event. Therefore, there is no evidence of the delayed price discovery hypothesis within the CB regime; this result is consistent with Kim and Rhee (1997). Fig. 3 plots the cumulative averages abnormal returns over the event window for the big and small portfolios within the CB regime.

### 5.4. Cross-sectional regressions

Table 9 presents the results of the cross sectional (OLS) regression of Eq. (5). The models are well specified (F statistics are highly significant). The *R*-squared is 32% and 37% for the upper and lower limits' models respectively. Table 9 reports that the SPL dummy is negative and significant. This suggests that abnormal returns are less prevalent within the SPL regime. The negative sign of ln mcap as a proxy for size suggests the small firm effect, as small firms tend to have greater reversals post event period. This result is consistent with the literature on the overreaction hypothesis e.g. Cox and Peterson (1994) and Farag and Cressy (2010).

We also find that the initial abnormal return on event day is negative in sign and significant in the two models. This suggests that price reversals are expected post limits hits. This result is consistent with Cox and Peterson (1994). Interestingly, the leakage of information variable (Leak) is positive and significant for the upper limit model. This suggests that upper limit hits might be predictable pre event. This result implies the role of insider trading and market

**Table 9**
Cross sectional regressions.

| Dependent variable $CAAR_i$ | Upper hits | Lower hits |
|---|---|---|
| *C* | 1.7719** (0.7581) | 1.9500* (1.0102) |
| $AR_{i0}$ | −2.9834** (1.4622) | −5.2833** (2.3474) |
| SPL | −0.3391** (0.1453) | −0.3517* (0.1747) |
| Ln mcap | −0.1042*** (0.0410) | −0.0988* (0.0501) |
| Leak | 0.9480** (0.4172) | −0.9608 (0.8338) |
| GFC | 0.1581 (0.2547) | 0.7459** (0.3591) |
| $R^2$ | 0.3204 | 0.3742 |
| *F*-stat | 3.8202*** (0.0059) | 4.6895*** (0.0030) |

$CAAR_i$ is the cumulative average abnormal returns for company (i) over the event window (140 days). $AR_{i0}$ = Average initial abnormal return for company (i) in event day $t$ = 0. ln $mcap_i$ is the natural log of the free floated market cap of company (i) one day before the event. $Leak_i$ is cumulative average abnormal returns for three days before event date as a proxy for the leakage of information. SPL is a dummy variable = 1 if the SPL regime is in operation and 0 otherwise. GFC: is a dummy variable which takes the value of 1 if the event occurs during 2007–2010 and 0 otherwise.
*, **, *** Indicate significance at the 1%, 5% and 10% levels. Robust standard errors are presented between parentheses.

inefficiency in the EGX. Finally, as expected, the dummy variable GFC is positive and significant within the lower limit hits reflecting the negative impact of the global financial crisis period.

## 6. Summary and conclusion

The main objective of this paper is to investigate the influence of price limits on the overreaction hypothesis in the Egyptian stock Exchange (EGX) during the period 1999–2010. I find evidence of the overreaction anomaly in the EGX. Price reversal is observed two and three days post lower and upper limit hits respectively within the SPL regime. However, price reversal occurs one day post event within the CB regime. These results support the directional effect hypothesis of Brown and Harlow (1988); as large stock price movements are followed by price reversals in the opposite direction.

Moreover, I find evidence to support the magnitude effect hypothesis, as the larger the initial price movements the greater the subsequent reversals. Furthermore, the results support the small firm effect for the lower limits within the SPL regime as volatility is more likely to be higher for small firms (Huang, 1998). However, the results do not support the effect of firm size on the overreaction hypothesis within the circuit breakers regimes. Finally, the main findings of the cross sectional regression show evidence that small firms tend to have greater reversals compared with large firms in the post event period. This result is consistent with Cox and Peterson (1994) and Farag and Cressy (2010) and support the overreaction hypothesis in the EGX and in particular the directional effect hypothesis of Brown and Harlow (1988). The paper provides clear evidence of stock market imperfection as the result of imposing different price limits regimes. Exploring market imperfections works as an early warning system to the regulator in emerging markets.

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