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The Price and Volume Effect of Single-Stock Futures Trading on the Pakistani stock market

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Abstract

The advent of single-stock futures (SSFs) provides an opportunity to investigate the company-wide impact of futures trading rather than the market-wide response captured through index futures contracts. This study analyzes the price and volume effect of SSFs on the underlying spot market based on a sample of 26 Pakistani firms. The dataset used includes one-year pre- and post-event data on closing prices and trading volumes. We conduct an event study in which the abnormal returns of individual companies and average abnormal returns reveal that futures trading has very little impact on the underlying spot returns. The cumulative abnormal returns show that statistically significant positive abnormal returns are experienced after SSF trading but with negative returns in the pre-event period. We compare pre- and post-event average normalized volumes using the t-test and dummy variable regression; the trend coefficients show a general decrease in trading volume. Consequently, there is an increase in returns and decrease in trading volume post-SSF trading in the Pakistani market.

Keywords: Futures pricing, trading volume, event study.

JEL classification: G13, G12, G14.

1. Introduction

Single-stock futures (SSFs) are futures contracts that are traded on the stock exchange. They represent a commitment to buy or sell shares at a predetermined rate for particular companies listed on the stock exchange. These contracts are also known as individual equity shares and are categorized as derivatives. Their value and existence depends on the underlying stock, i.e., they rely on the price of the underlying ordinary shares.

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When an SSF contract expires, the holder of the contract purchases it from the seller at a predetermined price. The gain or loss for both parties is determined by the difference between the spot and futures price at the time of expiration. Futures contracts can be closed prior to the expiration of the contract date by taking a reverse position; the return will be determined by the difference between the initial price and existing future price.

The concept of cost-of-carry explains the link between the spot and futures markets. Strong (2005) defines the cost of carry as the net cost incurred in carrying forward an asset in time. Two main costs are incurred: the carrying charges (interest) and the carrying returns (dividends). The fair value of futures contracts depends on the cost-of-carry and spot price of the underlying ordinary shares.

Having established the link between spot and futures markets, the basic assumption behind the futures market is that price relies on the underlying spot asset. A reciprocal relationship may also exist between the two markets, which gives rise to the question, to what extent do SSFs affect the underlying spot market.

Much of the literature looks at the impact of derivatives trading on the underlying spot market (see Kumar & Mukhopadhyay, 2004, for evidence from the Indian stock market). Khan (2006) and Ahmad, Shah, and Shah (2010) investigate the Pakistani stock market in this context; their studies represent the most recent work carried out with the index as the underlying asset. Previous studies present conflicting views on stock market volatility: some results support reduced spot volatility, others support increased spot volatility, and some argue that futures trading has no effect on the spot market. The introduction of SSFs gives researchers the opportunity to reinvestigate this topic because they allow a direct valuation of the probable impact on the underlying assets. Stock index futures contracts (SIFCs) can help assessment market-wide impacts while SSFs are useful for assessing company-wide impacts.

Most studies on derivatives trading have focused on options or SIFCs; this has yielded contrasting opinions because certain arguments may apply to one derivative but not to the other. Ross (1976), Miller (1977), Detemple and Selden (1991), and Figlewski and Webb (1993) have all presented conceptual frameworks on the impact of options trading on the underlying spot market. Stock futures and options are both forms of derivative securities with different patterns of return and leverage, but we assume that these theories hold for both.

Ross (1976) argues that the introduction of derivatives may increase new investment opportunities, in turn increasing the utility of investors. This can result in a low required rate of return, thereby increasing the demand for securities. This increase in demand by investors can lead to high equilibrium prices in the underlying market, reducing volatility, and allowing markets to become more efficient or to stabilize.

There are different types of investors in the stock market depending on their objectives. Derivative securities provide opportunities for risk-takers as well as risk-averse investors. Under the diminishing short-sales restriction theory, introducing derivatives allows markets to become more efficient by creating synthetic short positions, i.e., writing a call and buying a put. This allows pessimistic investors to trade on negative information concerning a stock that was previously restricted by rules.

Miller (1977) argues that information efficiency is restricted by short-sales constraints due to which negative information cannot be incorporated into share prices. Only optimistic investors will buy and sell shares, resulting in a supply-demand imbalance and thereby leading to high equilibrium prices. Short-sales constraints enable the market to under-weigh the negative view of share prices, resulting in over-valuation or an upward bias (Figlewski & Webb, 1993). These high equilibrium prices are corrected by arbitrageurs involved in short positions. Negative information is incorporated into prices such that a reduction in the asymmetric response to information yields information efficiency. As short-sales activity increases, there will be lower equilibrium prices and volatility.

The improved information environment hypothesis has several dimensions. A reduction in short-sales constraints, for instance, will lead traders to incorporate negative information into share prices and obtain higher payoffs through better information. With the transfer of informed traders from the spot market to the futures market, there is an expected decrease in trading volume. Another dimension of the theory holds that, as analysts' and media coverage increases due to the introduction of derivatives, the mix of speculators, insiders, and uninformed traders will change. The increased interest in shares will then lead to higher liquidity and more precise forecasting.

Pakistan has faced many challenges in the development of its capital markets, similar to other developing countries. The Karachi Stock Exchange (KSE) was established in 1947 and is the country's oldest and largest stock exchange. It provides products such as the cash market, futures contracts (cash settled and deliverable), and SIFCs. The trading of SSFs at the KSE started on 1 July 2001. Cash-settled futures contracts and SIFCs were introduced in 2007 and 2008, respectively.

It is commonly held that derivatives trading can reduce volatility in the spot market, with numerous studies having discussed the effect of derivatives on stock price volatility and, recently, the impact of futures trading on the cash market. Strict regulations have been introduced to control futures trading without any empirical evidence that derivatives trading increases volatility in the spot market (Ahmad et al., 2010). Consequently, futures trading offers several benefits: efficiency in trading, price discovery, liquidity, and a price stabilization function.

This study attempts to fill the research gap on SSFs in the Pakistani stock market. Other studies on the impact of SSFs on the underlying spot market (price effect, volume effect, and volatility effect) have analyzed the case of developed countries such as the US, UK, Australia, and South Africa. Our study, therefore, is a useful addition to the literature from a Pakistani perspective and could prove beneficial to capital market regulators, academics, and general investors. If futures trading is shown to have a stabilizing effect on the spot market, regulators should introduce new derivatives products such as options and reduce strict regulations. If the findings reveal a destabilizing effect on the spot market, regulators should impose stricter regulations.

The futures market is considered more volatile than the spot market. The close link between the two can be a source of volatility (from the futures market to the spot market). Pakistan imposes strict regulations on derivatives trading but without any empirical evidence of its impact on the spot market. Consequently, the derivatives market does not yield any substantial gains.

Our aim is to determine the impact of SSF introduction in Pakistan on the price (return) of the security (price effect) and the trading volume (volume effect), and to guide stock market regulators in this context. This study is delimited to the Pakistani stock market and specifically to the sample firms included over the period 1 July 2001 to February 2008.

2. Literature Review

There are two main views concerning futures trading: the stabilizing effect (pro-derivatives) and the destabilizing effect (anti-derivatives). The pro-derivatives argument states that markets become more efficient and investors obtain better returns after the advent of futures trading. The anti-derivatives view, which generally prevails worldwide, holds that derivatives are highly leveraged products that attract speculators who then destabilize markets to earn short-term profits.

Peat and McCorry's (1997) pioneering study on the impact of SSFs on the underlying spot market investigates ten SSF firms in Australia. Their conceptual framework draws on the complete markets theory, diminishing short-sales theory, and improved information environment hypothesis. Analyzing the price, volume, and volatility effect of SSFs, they find no significant change in returns but an increase in the volatility and volume of the underlying spot market. Lee and Tong (1998) analyze the impact of stock futures trading on the underlying spot market in Australia, based on a sample of seven stock futures firms as the control group. Their results yield significantly higher means of volumes with little variation after the introduction of stock futures. The control sample results also show that returns are not volatile post-SSF trading.

Dennis and Sim (1999) carry out an empirical study on stock price volatility in Sydney's futures exchange. Using a sample of ten individual equity shares firms, they employ an asymmetric exponential autoregressive conditional heteroskedastic (E-ARCH) model to determine time-varying volatility. Their findings show that futures trading does not lead to increased volatility in the underlying spot market, unlike spot market trading, which does. McKenzie, Brailsford, and Faff (2000) examine SSF trading and its impact on spot price volatility, using a threshold generalized ARCH model (T-GARCH) for asymmetric formulation. They find a reduction in unconditional volatility and a decline in systematic risk. The conditional volatility coefficient changes post-SSF trading (decrease in ARCH and GARCH terms). However, the results for the asymmetric response of SSF firms after futures trading are not clear or consistent.

Hung, Lee, and So (2003) investigate the effect of foreign-listed SSFs on the underlying domestic spot market, using the GARCH and Glosten-Jagannathan-Runkle (GJR) GARCH models to test conditional volatility. They find no change in the unconditional variance post-futures trading. Futures trading brings about structural changes in conditional volatility. The conditional volatility of the domestic equity market rises due to shocks associated with its foreign-listed firms. These shocks are predictable and show high variation, which reduces the conditional volatility. Generally, all the firms in the sample showed a decrease in the ARCH term (slow incorporation of information into prices), a decrease in the GARCH term (less long-lasting impact of information), and a small autoregressive root (smaller persistence of volatility).

Faff and Hillier (2003) examine the impact of equity options on the underlying equity market in the UK. They test the three theories of options trading (complete markets, diminishing short-sales, and improved information environment) based on a sample of 86 firms. The authors find positive abnormal returns post-options trading as well as a statistically significant increase in volume and volatility. Raul (2005) investigates the impact of stock futures on the Indian stock market. The study examines price discovery and the liquidity effect of stock futures, arguing that index futures, index options, and options on shares do not generate enough liquidity in the spot market. However, stock futures increase volume in the futures market and raise market depth. The price discovery mechanism is removed by the termination of the carry-forward system.

Paulden (2005) studies the emergence of SSFs in the US market, where the relative lack of interest has led to low volumes and little activity in the One-Chicago exchange while the NASDAQ LIFFE has ceased to operate SSFs. Although the aim of introducing stock futures was to generate liquidity, this has not happened. Jones and Brooks (2005) provide an overview of the introduction and development of stock futures trading in the US. They give numerous reasons for the low popularity of stock futures among individual investors, including the lack of awareness of stock futures, different tax laws, and margin requirements.

Ang and Cheng (2005) investigate market stabilization and changes in market efficiency post-stock futures introduction in the US spot market. They test market efficiency by creating a ten-day event window in which they examine large positive or negative returns on stock futures and the matching sample. Large stock returns are shown to decrease, and this reduction is smaller than in the matching sample. The decrease in unexplained returns is positively correlated with stock futures. The authors conclude that the market becomes more efficient post-stock futures trading. Aitken and Segara (2005) look at the impact of warrants introduction in Australia, and include individual equity shares in their analysis. They find negative abnormal returns post-warrants introduction. The individual equity firms experience higher volatility and an increase in relative trading volume after the introduction of warrants.

Chau, Holmes, and Paudyal (2005) study the impact of SSFs on feedback trading and market dynamics in the underlying spot market. Based on a sample of 80 SSFs with a matching sample, they use a GJR-GARCH model to capture time-varying volatility. Their results indicate no change in unconditional volatility, the ARCH and GARCH terms, or the asymmetric response related to futures trading. Mazouz and Bowe (2006) examine the effect of SSF trading in the UK, using a sample of 21 SSF firms with a control sample. They employ a GJR-GARCH model to determine volatility and a three-factor (Fama and French) model to estimate systematic risk. The results indicate a decrease in systematic risk and a reduction in unconditional volatility. This implies faster dissemination of current information in prices post-SSF trading.

Clarke, Gannon, and Vinning (2007) look at the impact of warrants trading on the Australian equity market. Based on a sample of ten individual equity shares, they observe negative cumulative abnormal returns (CARs) around the introduction of warrants and a fall in trading volume post-introduction. Call warrants are higher in volume than others. The study concludes that there is no change in the variance or beta term after the introduction of warrants. De Beer (2008) studies the impact of stock futures trading on the South African spot market, using a sample of 38 companies. The study's results indicate no statistically significant change in price, although the trading volume shows a statistically significant increase post-stock futures trading. There is a reduction in volatility with changes in the structure of volatility. Systematic risk remains unchanged post-futures trading.

Khan (2006) studies the impact of futures trading on spot volatility in Pakistan. Applying a GARCH (1,1) model and vector error correction model, the author finds that the spot market leads the futures market in incorporating new information. While the volatility observed in the spot market is not caused by futures trading, the volatility in the futures market is a result of spot market outgrowth. Khan and Hijazi (2009) use a sample of 28 shares (for a sample and matching group) to determine the effect of open interest, spot volume, and futures volume on share price volatility in Pakistan. They find that the introduction of stock futures decreases volatility in a spot market, implying that spot volume and volatility have a positive relationship.

Ahmad et al. (2010) study the impact of futures trading on stock prices in Pakistan based on three data series: i.e., spot series, futures series, and market index. Using a GARCH model, Granger causality, and the

Johansen co-integration test, the authors find evidence of volatility clustering and persistence in returns. The market index is found to be a predictor of the spot and futures markets, but the two markets do not Granger-cause each other or the market index. Generally, all the markets are found to be highly volatile, with each market responsible for increasing volatility in the others.

Khan, Shah, and Abbas (2011) investigate the impact of SSF trading on spot market volatility. They use traditional measures to capture volatility—including the F-test, Bartlett's test, close-to-close variance estimator, and Parkinson's estimator—and a GJR-GARCH model to test for conditional volatility. Both analyses yield mixed results: the GJR-GARCH analysis shows a partial reduction in volatility for both SSF firms and the control sample. This limited decrease in volatility could be a result of other market-wide factors.

Siddiqui, Nouman, Khan, and Khan (2012) study the liquidity effects of stock futures in Pakistan, using volume, trading value, the number of trades, and value per day as proxies for liquidity. The paired difference test for two population means is used to analyze pre- and post-event liquidity, and Hotelling's T-square test is applied to test the study's hypothesis. The authors find a significant increase in volume, trading value, and the number of trades. They conclude that the liquidity of the underlying spot market increases after stock futures trading.

As we have mentioned earlier, existing studies on stock futures present mixed results with respect to prices, with most studies favoring an increase in volume and the stabilizing effect of futures trading. The bulk of the literature on stock futures focuses on the relationship between the advent of stock futures and their impact on volatility. Fewer studies have looked at the price/return and volume effect on the underlying spot market. Globally, stock futures are relatively new derivative products, which implies that there is less research on them in the context of developed and developing markets.

3. Research Methodology

This section describes our data sample and methodology.

3.1. Data and Sample

The sample for this study was selected based on the following criteria: (i) any SSF delisted during the sample period was excluded from analysis, and (ii) a stock must have daily price data for the whole period to be selected. Previous studies have used sample periods ranging from three months to three years. To avoid any bias, we use one-year pre- and post-event data. Given that trading in individual stock futures on the KSE commenced in July 2001, the sample period for this study begins on 1 July 2001 and ends in February 2008.

We include 26 companies out of a total of 46. Data on the daily closing share prices and trading volumes was obtained from the online database of the *Business Recorder* for a period of one year before and after the listing of each stock. This yields more than 250 daily observations per stock for each sub-period (Table A1 in the Appendix).

3.2. Hypotheses

The study applies the following hypotheses:

- H0: The introduction of SSFs has no impact on the underlying stock price.
- H1A: The introduction of SSFs has either a positive or negative impact on the underlying stock price.
- H0: The introduction of SSFs has no impact on the underlying spot volume.
- H2A: The introduction of SSFs has either a positive or negative impact on the underlying spot volume.

3.3. Methodology

This section applies statistical techniques to determine the price and volume effect of SSF contracts on the Pakistani stock market. The conceptual framework draws on the complete markets theory, diminishing short-sales theory, and improved information hypotheses. Our methodology is based on De Beer (2008) and Clarke et al. (2007).

The equation below is used to calculate the returns on each stock:

$$R_{it} = \ln\left(P_t / P_{t-1} \right) \tag{1}$$

where R_{it} is the return of stock i in period t, P_t is the closing price of stock i on day t, and P_{t-1} is the closing price of stock i on day $t-1$.

3.4. Price Effect

The probable effect of SSFs on the spot market is as follows:

	Expected change in underlying spot market		
Characteristic	Complete markets	Diminishing short-sales restriction	Improved information environment
Price/returns	Positive	Negative	Either positively related to futures expectation

Source: Clarke, Gannon, and Vinning (2007).

3.4.1. Event Study

Event studies are conducted to determine the impact of an event on the underlying spot market and are a commonly used method in finance studies. Campbell, Lo, and MacKinlay (1997) state that the event study methodology can be used to capture the effect of an event on listed firms based on financial data. The impact of an event can result in unanticipated changes in stock prices (either positive or negative) for firms engaged in futures trading. The method uses statistical techniques to estimate the impact of an event in a specific period and draw relevant conclusions.

For the event study to be feasible and practical, individual company returns need to be independent. The event of investigation should be isolated from other events as far as possible. The assumption of constant systematic risk is maintained so that normal or expected returns can be calculated using the beta coefficient.

3.4.2. Market Model

The market model is used to estimate the beta terms and calculate both normal and abnormal returns. Abnormal returns are calculated as actual returns minus normal returns. A risk-adjusted model is used to regress the return on a particular security on the return on the market index. Ordinary least squares (OLS) are used to calculate the intercept and slope, including a risk-adjustment process to calculate abnormal returns.

For any security i, the market model is given by:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{2}$$

$$E(\varepsilon_{it}) = 0 \quad \text{var}(\varepsilon_{it}) = \sigma^2$$

where R_{it} is the return on security i in period t, α_i is the constant or intercept term, β_i is the slope coefficient, R_{mt} is the return on the market index in period t, ε_{it} is the error term, and σ^2 is the variance of the error term.

The parameters of these equations are estimated using OLS: the parameters α_i, β_i, and ε_{it} obtained from the OLS regression are then used to calculate abnormal returns (Benninga, 2008) as follows:

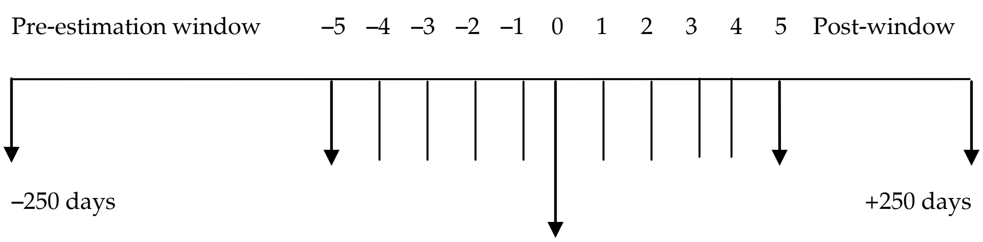
$$AR_{it} = r_{it} - (\alpha_i + \beta_i R_{mt}) \tag{3}$$

where r_{it} is the actual return on stock i in event-window day t and $(\alpha_i + \beta_i R_{mt})$ is the return predicted by the stock's α, β, and market return terms.

3.4.3. Measuring and Analyzing Abnormal Returns

Kothari and Warner (2006) hold that the main focus of an event study is to analyze the average abnormal return (AAR) and CAR on sample securities around the event of interest. The event day is an integral part of an event study because it is used to define pre- and post-time periods (days). Once the event day is known, the average price movement of the sample securities is investigated for particular days after the event.

Event window



The timeline of the event study is designed to remove any overlaps between the pre-estimation window, event window, and post-event window. This segregation helps estimate a normal returns model without the returns influencing the event. Thus, the event window alone is used to analyze the event. This fulfills the assumption that the impact of an event is captured by the abnormal return.

3.4.4. AAR

Abnormal returns are summed across the event days to calculate the overall effect of an event on prices. The summation of returns can be in both directions across the sample securities or over time. We have aggregated returns across the sample securities because a single-event impact was to be investigated for numerous firms in different industries. The sample security's returns are summed and averaged individually to obtain the AAR:

$$AR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{it} \quad (4)$$

3.4.5. CAR

The CAR analyzes total returns during the event window and is an aggregate of the initial day to a specific day in the event window:

$$CAR_{t1,t2} = \sum_{t=t1}^{t2} AR_{it} \quad (5)$$

3.4.6. Day Effect

The day effect helps determine whether futures trading has had any impact on the event day, where the dummy variable is 1 for the event day and 0 for all other days:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \delta D_f + \varepsilon_{it} \quad (6)$$

3.5. Volume Effect

Trading volume is generally a highly volatile factor resulting in large variances (Clarke et al., 2007) and may exhibit many outliers with a nonnormal distribution. To normalize the data, therefore, we apply an exponential smoothing process. The smoothed volume data is then analyzed.

	Expected change in the underlying spot market		
Characteristic	Complete markets	Diminishing short-sales restriction	Improved information environment
Volume	Higher	Unclear	Unclear

Source: Clarke, Gannon, and Vinning (2007).

The exponentially weighted moving average (EWMA) process entails assigning exponentially decreasing weights to old data. Single smoothing is suitable for data that moves around a constant mean randomly with no trend or seasonality, while double smoothing is used for data that has a linear trend. The smoothed series is the weighted average of past values in which exponentially decreasing weights are assigned to old data. The smaller the smoothed or damping factor, the smoother will be the calculated series (National Institute of Standards and Technology, 2006).

We apply the following exponential smoothing formula:

$$S_t = \alpha y_t + (1-\alpha)S_t - 1 \quad (7)$$

$$D_t = \alpha S_t + (1-\alpha)D_t - 1 \quad (8)$$

where α is the smoothing factor, S_t is the single-smoothed series, D_t is the double-smoothed series, and y_t is the raw data (see Quantitative Micro Software, 2007).

3.5.1. *Difference-of-Means t-Test*

The t-test is applied to determine the change in the mean of the average normalized volume before and after the event in order to detect any permanent statistically significant change in trading volume.

3.5.2. *Regression Analysis*

Generally, the trading volume tends to increase over time. Since trends in the trading volume cannot be detected by the t-test, we conduct a dummy variable regression to identify any significant changes in volume trends. The following equation is used to estimate volume:

$$V_{it} = \alpha_i + \beta_i T_{it} + \delta D_f + \varepsilon_{it} \quad (9)$$

where V_{it} is the normalized volume of security i in period t, α_i is the constant, $\beta_i T_{it}$ is the trend coefficient, and δD_f is the dummy variable (0 for pre-event data and 1 for post-event data).

4. Results and Discussion

This section presents the study's results for the price and volume effect of the sample SSFs.

4.1. Price Analysis

4.1.1. Descriptive Analysis

This section analyzes the nature of returns with respect to a normal distribution. The descriptive statistics given in Table A2 (see Appendix) indicate that the returns are not normally distributed. The pre-event data for the shares BAFL, DGKC, and LUCKY have a normal distribution; in the post-event period, only PIOC exhibits normally distributed returns. BAFL and PIOC show less excess kurtosis in the pre-event period. Normally distributed shares are likely to have rounded peaks while shares with less excess kurtosis will have shorter, thinner tails.

The kurtosis results help us identify the peakedness of the returns: in most cases, their kurtosis value is greater than 3 (excess kurtosis). Skewness measures the dispersion or asymmetry of returns: in most cases, returns are negatively skewed. Each of the returns has different kurtosis and skewness values. Of the 26 shares in the sample, the returns on ten increased between the pre- and post-event period, while the returns on the remaining 16 shares decreased. Our preliminary investigation reveals that the decrease in returns can be attributed to a stabilizing rather than destabilizing market.

The unit root of the series is tested using the augmented Dickey-Fuller (ADF) test. The test statistics are compared to the critical values in absolute form. If the ADF statistics exceed the critical value, the null hypothesis of the unit root cannot be accepted. If the test statistics do not exceed the critical value, then the null hypothesis of the unit root cannot be rejected and the series is said to be nonstationary, which can lead to spurious results. In this case, all the returns are stationary at level (Table A3 in the Appendix).

4.1.2. Event Study Analysis

The FFC and KAPCO shares show statistically significant abnormal returns on one day (Table A4 in the Appendix). AKBL, BAFL, BOP, IBF, PIOC, and POL exhibit statistically significant abnormal returns on two days. ENGRO, FABL, FFBL, MCB, NBP, PIA, and PSO show significant abnormal returns over three days. DGKC, HUB, KESC, MPLF, NML, SSGP, and TELE show significant abnormal returns over four days. The presence of statistically significant abnormal returns over one, two, three, and four days implies that the introduction of SSFs has had very little impact on the share prices.

SNGP shows five-day significant abnormal returns while DSFL, LUCKY, and PTCL show six-day significant abnormal returns. Lucky Cement is the only company to indicate some price effect as a result of SSF trading with six days of abnormal returns starting from the pre-event period up to the event day. FFBL and Lucky Cement are the only two companies to show significant abnormal returns on the event day. Overall, analyzing the individual companies reveals that the advent of SSFs has had no impact on the underlying share prices.

In terms of AARs, only two days indicate statistically significant negative abnormal returns in the pre-event period (Table A5 in the Appendix). In terms of CARs, all the returns are statistically significant except on the second day post-event (Table A6 in the Appendix). CARs tend to become positive after the introduction of SSFs, implying that the latter exercise a positive impact (Figure A1 in the Appendix).

4.1.3. Day Effect Analysis

Only three companies exhibit statistically significant results. We can infer, therefore, that SSF trading does not affect share prices on the event day (Table A7 in the Appendix).

4.2. Volume Analysis

4.2.1. Descriptive Analysis

As mentioned earlier, trading volume tends to be highly volatile and can result in large variances, many outliers, and nonnormal distributions. The results of the Jarque-Bera test suggest that all the companies in the sample have a nonnormal distribution (Table A8 in the Appendix). The volume of ten shares increases while that of 16 shares decreases between the pre-event and post-event period. There is positive skewness in all instances and excess kurtosis in most cases except for AKBL, BOP, FFBL, MCB, and PSO post-event.

4.2.2. T-Test Analysis

The results of the t-test show that 16 shares decrease in volume post-SSF introduction, of which 13 are statistically significant (Table A9 in the

Appendix). Ten shares exhibit an increase in volume post-SSF introduction, of which eight are statistically significant (Figure A2 in the Appendix).

4.2.3. Regression Analysis

Once the trend is incorporated in the volume series, there are 21 cases in which volume decreases with only three that are statistically significant (Table A10 in the Appendix). The volumes of five shares decrease post-SSF introduction, with only one share exhibiting statistical significance (Figure A3 in the Appendix).

5. Discussion

Our analysis of individual companies shows that stock futures have little effect on price, which is further supported by the analysis of AARs. However, the event study focuses on CARs and shows that all the days are significant except one, while abnormal returns are negative in the pre-event period and positive post-event. This implies that the event has a positive impact on share prices.

Our study is in line with the complete markets theory and improved information environment hypothesis, but is in contrast to the diminishing short-sales restriction theory. The complete markets theory explains an increase in prices through the participation of investors in the shape of more investment opportunities created by futures trading. The improved information environment hypothesis states that greater coverage by the media and analysts will result in more positive expectations from the spot market and thereby in an increase in prices. However, the diminishing short-sales restriction holds that synthetic short positions in the futures market but not in the spot market lead to an imbalance in supply and demand, which results in a decrease in prices. The results of this study are similar to Faff and Hillier (2003).

We find a decrease in trading volume post-SSF trading, which is in line with Clarke et al. (2007). The study's results are in contrast to the complete markets theory, which predicts an increase in volume due to greater participation by investors (more complete markets) post-SSF introduction. The diminishing short-sales restriction theory is unclear on the volume effect because short sales occur in futures markets but not in spot markets. Our study is in line with the improved information environment hypothesis, which states that increased interest among market makers will shift the trading volume from the spot market to highly leveraged derivatives. The substitution theorem presented by Clarke et al. (2007) categorizes derivatives as speculating instruments. Futures trading gives speculators the incentive to shift their activity from the spot market to the futures market.

6. Conclusion and Recommendations

We have found that the abnormal returns on individual shares and AARs have little effect on the underlying spot prices. Positive CARs occur post-SSF introduction, which shows that the event has had a positive impact (in line with the complete markets theory and improved information environment hypothesis). Three companies exhibit statistically significant results on the event day (introduction of stock futures), but this provides no overall evidence for the sample. The individual company analysis shows that SSFs have had very little or no impact on the underlying equity shares. The event study and CAR analysis shows that there is a positive price/return impact on underlying spot prices.

The decrease in trading volume experienced by the majority of SSF firms, including the trend coefficient for a normal increase in volume over the period, leads us to conclude that stock futures trading results in a decrease in spot market volume. This reflects the diminishing short-sales restriction theory. The decrease in trading volume can be attributed to insiders or speculators moving from the spot market to the futures market (Faff & Hillier, 2003).

Pakistan has moved toward developing its stock market by introducing stock futures on 1 July 2001 and index futures on 1 April 2008. This study supports the stabilizing effect on the spot market, implying that new derivative products should be launched and strict regulations on the derivatives market withdrawn. Further research could look at the low interest in futures trading in Pakistan and the impact of stock futures trading on share price volatility in an asymmetric model.

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Appendix

Table A1: Sample firms included in study

No.	Code	Company Name	Listing date
1	DSFL	Dewan Salman Fibers Ltd	1 July 2001
2	ENGRO	Engro Chemicals Ltd	1 July 2001
3	FFC	Fauji Fertilizer Co. Ltd	1 July 2001
4	HUBC	Hub Power Co. Ltd	1 July 2001
5	MCB	MCB Bank Ltd	1 July 2001
6	NML	Nishat Mills Ltd	1 July 2001
7	PIAA	Pakistan International Airline (A)	1 July 2001
8	PSO	Pakistan State Oil Co. Ltd	1 July 2001
9	PTCL	Pakistan Telecommunication Ltd	1 July 2001
10	SNGP	Sui Northern Gas Pipe Line Ltd	1 July 2001
11	IBFL	Ibrahim Fibers Ltd	1 January 2002
12	FFBL	Fauji Fertilizer Bin Qasim Ltd	25 November 2003
13	DGKC	D. G. Khan Cement Co. Ltd	21 June 2004
14	SSGC	Sui Southern Gas Co. Ltd	21 June 2004
15	LUCK	Lucky Cement Ltd	21 June 2004
16	MLCF	Maple Leaf Cement Factory Ltd	21 June 2004
17	NBP	National Bank of Pakistan	21 June 2004
18	POL	Pakistan Oilfields Ltd	21 June 2004
19	AKBL	Askari Commercial Bank Ltd	20 September 2004
20	BOP	Bank of Punjab	20 September 2004
21	FABL	Faysal Bank Ltd	20 September 2004
22	TELE	Telecard Ltd	20 September 2004
23	BAFL	Bank Alfalah Ltd	20 February 2006
24	KAPCO	Kot Addu Power Company	20 February 2006
25	KESC	Karachi Electric Supply Corporation	20 February 2006
26	PIOC	Pioneer Cement Ltd	20 February 2006

Source: Authors' calculations.

Table A2: Descriptive statistics, pre- and post-event period analysis of returns

Firm		Mean	Median	SD	Skewness	Kurtosis	J-B (Prob)
AKBL	PRE	0.001818	0.000802	0.024528	-0.116949	5.867304	0.000000
	POST	0.000427	0.001120	0.026661	-3.159686	33.27739	0.000000
BAFL	PRE	0.002238	0.000880	0.026263	0.143407	2.934940	0.632737
	POST	-0.00136	-0.001331	0.032239	-2.83198	26.12280	0.000000
BOP	PRE	0.002104	0.000000	0.031458	-0.544718	8.943588	0.000000
	POST	0.002191	0.001965	0.028169	-0.61571	5.958310	0.000000
DGKC	PRE	0.003818	0.001922	0.029284	0.257456	3.292773	0.156205
	POST	9.26E-05	0.000000	0.027544	-0.17558	4.929132	0.000000
DSFL	PRE	-0.00178	-0.002463	0.022010	0.227127	3.963286	0.002473
	POST	-0.00105	-0.002946	0.035648	0.112480	4.628946	0.000001
ENGRO	PRE	-0.00016	-0.001695	0.024556	-1.13434	20.53065	0.000000
	POST	0.000446	-0.000861	0.026616	0.257929	4.819107	0.000000
FABL	PRE	-0.0008	0.000000	0.025916	-0.296561	6.462142	0.000000
	POST	0.002389	0.001695	0.028794	-1.447169	12.54697	0.000000
FFBL	PRE	0.003434	0.000000	0.036627	0.544078	4.402487	0.000000
	POST	0.002917	0.000000	0.034568	6.917259	82.26043	0.000000
FFC	PRE	-0.00059	0.000000	0.018195	-1.929945	20.03056	0.000000
	POST	0.001277	0.000000	0.020880	-0.384204	6.804609	0.000000
HUB	PRE	0.000848	0.000000	0.023367	0.454959	5.014641	0.000000
	POST	0.001073	0.001992	0.031860	-0.532092	7.928861	0.000000
IBF	PRE	-0.00185	-0.002752	0.029535	-2.350226	32.54064	0.000000
	POST	0.002500	0.000000	0.025827	0.448785	6.880077	0.000000
KAPCO	PRE	0.006422	0.000000	0.103599	14.93147	233.1844	0.000000
	POST	0.000347	-0.001027	0.017317	-0.974962	10.76900	0.000000
KESC	PRE	0.002303	0.000000	0.040577	1.138963	6.968372	0.000000
	POST	-0.00261	-0.005883	0.034155	1.061914	7.464328	0.000000
LUCKY	PRE	0.003648	0.003371	0.032383	0.268578	2.996925	0.217210
	POST	0.001039	0.000000	0.027052	0.230746	3.746373	0.016995
MCB	PRE	-0.00071	0.000000	0.026393	-0.835149	7.452103	0.000000
	POST	0.000309	0.000000	0.030039	-0.400185	4.715605	0.000000
MPLF	PRE	0.004983	0.003474	0.033444	0.411606	3.141849	0.024909
	POST	-0.00183	-0.00161	0.026548	0.222215	4.513244	0.000002
NBP	PRE	0.003306	0.002236	0.024441	-1.118156	14.49332	0.000000
	POST	0.002022	0.001243	0.024330	-0.252132	6.488759	0.000000
NML	PRE	-0.00139	-0.001947	0.029031	-0.944812	14.32920	0.000000
	POST	-0.00012	0.000000	0.035714	0.297645	5.462054	0.000000

Firm		**Mean**	**Median**	**SD**	**Skewness**	**Kurtosis**	**J-B (Prob)**
PIA	PRE	-0.00176	-0.006494	0.029331	0.472140	4.351031	0.000001
	POST	0.002103	0.000000	0.047071	1.134708	8.506081	0.000000
PIOC	PRE	0.004734	0.000000	0.030906	0.203684	2.353498	0.045507
	POST	-0.00305	-0.000919	0.029962	-0.172457	3.189590	0.440549
POL	PRE	3.86E-05	0.000801	0.039931	-8.157956	106.9128	0.000000
	POST	0.001182	0.000000	0.023380	0.363010	4.658282	0.000000
PSO	PRE	-0.00069	-0.000637	0.019481	-0.308695	6.143347	0.000000
	POST	0.000254	-0.00195	0.027764	0.405520	3.878640	0.000518
PTCL	PRE	-0.00156	0.000000	0.016132	-0.195548	5.703790	0.000000
	POST	7.84E-05	0.000000	0.028433	-0.077977	6.818665	0.000000
SNGP	PRE	-0.00115	0.000000	0.026061	-0.68887	9.479483	0.000000
	POST	0.001386	0.000000	0.035100	-0.231148	6.963864	0.000000
SSGP	PRE	0.001817	0.000000	0.027874	0.383698	3.480679	0.013051
	POST	-0.00117	-0.001756	0.024361	0.237826	3.695829	0.023300
TELE	PRE	-0.00235	-0.004362	0.027158	0.451215	3.480531	0.003961
	POST	-0.00103	-0.003766	0.037165	-1.842205	22.15414	0.000000

Source: Authors' calculations.

Table A3: Stationarity of returns

Name	ADF test: t-statistic	Prob.*
AKBL	-20.699	0.0000
BAFL	-20.784	0.0000
BOP	-19.946	0.0000
DGKC	-22.159	0.0000
DSFL	-20.793	0.0000
ENGRO	-19.899	0.0000
FABL	-19.344	0.0000
FFBL	-21.654	0.0000
FFC	-22.773	0.0000
HUB	-21.965	0.0000
IBF	-22.882	0.0000
KAPCO	-23.931	0.0000
KESC	-17.394	0.0000
LUCKY	-20.009	0.0000
MCB	-21.593	0.0000
MPLF	-21.061	0.0000
NBP	-19.139	0.0000
NML	-21.837	0.0000
PIA	-24.9	0.0000
PIOC	-18.08	0.0000
POL	-20.549	0.0000
PSO	-22.162	0.0000
PTCL	-21.855	0.0000
SNGP	-23.114	0.0000
SSGP	-19.478	0.0000
TELE	-20.213	0.0000

Source: Authors' calculations.

Table A4: Abnormal returns

Firm	Significant day	Pre-	Post-	Event day
AKBL	2	2		
BAFL	2	2		
BOP	2	2		
DGKC	4	3	1	
DSFL	6	4	2	
ENGRO	3	3		
FABL	3	2	1	
FFBL	3	2		1
FFC	1	1		
HUB	4	3	1	
IBF	2	2		
KAPCO	1	1		
KESC	4	2	2	
Lucky	6	4	1	1
MCB	3	3		
MPLF	4	3	1	
NBP	3	2	1	
NML	4	4		
PIA	3	3		
PIOC	2	2		
POL	2	2		
PSO	3	3		
PTCL	6	3	3	
SNGP	5	3	2	
SSGP	4	3	1	
TELE	4	3	1	

Source: Authors' calculations.

Table A5: AARs for event study

Day	AAR	SD	z-stat	Sig.
-5	-0.01	0.02	-0.31	No
-4	-1.16	0.49	-2.36	Yes
-3	-0.34	0.16	-2.06	Yes
-2	-0.03	0.03	-1.12	No
-1	-0.02	0.02	-0.73	No
0	0.00	0.03	0.16	No
1	-0.01	0.02	-0.61	No
2	0.00	0.02	-0.01	No
3	0.00	0.02	-0.17	No
4	0.01	0.03	0.18	No
5	0.01	0.02	0.56	No

Source: Authors' calculations.

Table A6: CARs for event study

Day		CAR	SD	z-stat	Sig.
-5	-5	-0.15	0.05	-2.71	Yes
-5	-4	-30.04	8.44	-3.56	Yes
-5	-3	-8.84	2.41	-3.67	Yes
-5	-2	-0.76	0.24	-3.14	Yes
-5	-1	-0.43	0.16	-2.75	Yes
-5	0	0.12	0.07	1.86	Yes
-5	1	-0.30	0.07	-4.20	Yes
-5	2	0.00	0.04	-0.12	No
-5	3	-0.07	0.03	-2.29	Yes
-5	4	0.15	0.06	2.61	Yes
-5	5	0.32	0.12	2.61	Yes

Note: z-stat = 2.58 implies 1% significance, z-stat = 1.96 implies 5% significance, z-stat = 1.64 implies 10% significance.
Source: Authors' calculations.

Table A7: Day effect of event

Name	Variable	Coefficient	SE	t-statistic	Prob.
AKBL	DF	0.00	0.02	-0.17	0.87
BAFL	DF	0.00	0.03	0.15	0.88
BOP	DF	0.00	0.02	0.08	0.93
DGKC	DF	0.03	0.02	1.23	0.22
DSFL	DF	-0.02	0.02	-1.00	0.32
ENGRO	DF	0.00	0.02	0.17	0.86
FABL	DF	0.00	0.02	0.13	0.90
FFBL	DF	0.08	0.02	3.21***	0.00
FFC	DF	0.01	0.01	0.38	0.71
HUB	DF	0.01	0.02	0.53	0.60
IBF	DF	-0.04	0.02	-1.79*	0.07
KAPCO	DF	0.00	0.07	0.00	1.00
KESC	DF	0.01	0.01	0.38	0.71
LUCKY	DF	0.05	0.02	2.20**	0.03
MCB	DF	0.01	0.02	0.42	0.68
MPLF	DF	0.02	0.02	0.76	0.45
NBP	DF	0.02	0.02	1.10	0.27
NML	DF	0.01	0.02	0.59	0.56
PIA	DF	-0.01	0.03	-0.44	0.66
PIOC	DF	0.00	0.03	0.16	0.87
POL	DF	0.00	0.03	-0.07	0.94
PSO	DF	0.00	0.02	-0.08	0.94
PTCL	DF	0.00	0.01	0.39	0.70
SNGP	DF	0.00	0.02	0.10	0.92
SSGP	DF	0.00	0.03	-0.11	0.91
TELE	DF	0.01	0.03	0.39	0.70

Note: DF is the dummy used for the day effect where 1 = event day and 0 otherwise.

Source: Authors' calculations.

Table A8: Pre- and post-event average normalized volumes (millions)

Firm		Mean	Median	SD	Skewness	Kurtosis	J-B (p-value)
AKBL	PRE	1799.1	613.9	2967.1	2.0	5.8	0.0
	POST	4159.2	1369.1	4614.3	0.6	1.8	0.0
BAFL	PRE	3389.6	2132.2	3710.7	1.6	4.8	0.0
	POST	4555.0	2446.6	5171.1	1.4	3.9	0.0
BOP	PRE	6896.3	3296.8	8644.6	2.2	8.0	0.0
	POST	11411.5	8225.6	10439.3	0.9	2.8	0.0
DGKC	PRE	26616.6	24812.2	14291.7	1.0	4.1	0.0
	POST	17915.9	15558.1	10553.5	1.4	4.7	0.0
DSFL	PRE	2553.5	2198.0	1518.1	1.1	3.8	0.0
	POST	2260.2	918.4	2964.5	1.9	6.0	0.0
ENGRO	PRE	3803.4	2944.6	3590.8	1.8	7.8	0.0
	POST	3225.7	2291.3	2842.7	1.9	8.4	0.0
FABL	PRE	960.9	529.2	1194.0	2.8	12.3	0.0
	POST	1189.8	616.4	1621.2	2.6	11.8	0.0
FFBL	PRE	16790.3	14279.5	10901.4	0.9	3.1	0.0
	POST	17854.1	16651.1	10554.7	0.6	2.4	0.0
FFC	PRE	2190.9	1468.8	2368.6	2.3	9.6	0.0
	POST	1928.6	1278.4	2063.9	2.8	13.1	0.0
HUB	PRE	34225.3	29449.5	24290.7	1.6	6.5	0.0
	POST	37389.2	27284.5	31032.0	1.4	5.1	0.0
IBF	PRE	793.7	142.7	1191.2	1.8	6.0	0.0
	POST	662.2	429.5	657.9	2.0	7.6	0.0
KAPCO	PRE	2039.9	1703.0	1753.3	1.1	4.4	0.0
	POST	1600.1	478.7	3530.5	3.7	17.3	0.0
KESC	PRE	3240.3	935.7	5526.2	2.5	8.5	0.0
	POST	1754.2	808.1	2462.1	2.8	11.3	0.0
LUCKY	PRE	14145.3	11982.9	10861.2	0.9	3.1	0.0
	POST	9643.6	7877.3	9009.0	1.3	4.0	0.0
MCB	PRE	2584.3	2573.0	1831.8	0.6	3.0	0.0
	POST	1922.0	1589.2	1389.3	1.2	3.9	0.0
MPLF	PRE	13747.0	11801.3	8731.1	0.8	2.7	0.0
	POST	3577.9	2436.6	3623.7	2.1	7.6	0.0
NBP	PRE	13251.8	11007.3	9332.9	1.3	4.9	0.0
	POST	19657.0	16674.4	12055.1	1.1	3.7	0.0
NML	PRE	1641.6	1118.3	1592.1	1.7	5.7	0.0
	POST	1351.7	1065.6	1100.2	1.4	4.8	0.0
PIA	PRE	116124.4	71682.7	129477.6	2.0	7.2	0.0

Firm		Mean	Median	SD	Skewness	Kurtosis	J-B (p-value)
	POST	175542.6	80555.6	233126.9	1.8	5.4	0.0
PIOC	PRE	1129.8	707.6	1203.3	1.8	5.5	0.0
	POST	554.7	461.4	399.9	0.9	3.2	0.0
POL	PRE	9934.7	7126.3	8382.9	1.8	7.0	0.0
	POST	9785.3	5663.0	10403.3	1.5	4.1	0.0
PSO	PRE	13496.7	12038.5	8965.8	0.6	3.3	0.0
	POST	7525.0	6754.9	4397.8	0.5	2.9	0.0
PTCL	PRE	25959.6	21918.0	16882.1	1.1	4.6	0.0
	POST	118432.6	23090.7	364666.6	4.0	19.1	0.0
SNGP	PRE	3486.6	1970.6	4049.9	2.7	11.5	0.0
	POST	5226.1	3536.8	5668.6	1.7	5.5	0.0
SSGP	PRE	9619.4	5301.9	13607.5	3.2	15.2	0.0
	POST	6229.5	2702.1	8696.7	2.4	8.7	0.0
TELE	PRE	2021.3	1119.2	2377.7	2.6	11.6	0.0
	POST	1213.7	625.1	1689.9	3.4	15.9	0.0

Source: Authors' calculations.

Table A9: T-test for change in means

Firm	Pre-	Post-	Change	t-test	Prob.
AKBL	1799	4159	2360	-5.999	0.000
BAFL	3390	4555	1165	-4.145	0.000
BOP	6896	11411	4515	-4.788	0.000
DGKC	26617	17916	-8701	7.139	0.000
DSFL	2554	2260	-293	1.422	0.156
ENGRO	3803	3226	-578	2.236	0.026
FABL	961	1190	229	-1.692	0.092
FFBL	16790	17854	1064	-1.049	0.295
FFC	2191	1929	-262	1.376	0.170
HUB	34225	37389	3164	-1.393	0.165
IBF	794	662	-132	1.651	0.100
KAPCO	2040	1600	-440	1.752	0.081
KESC	3240	1754	-1486	3.945	0.000
Lucky	14145	9644	-4502	4.375	0.000
MCB	2584	1922	-662	4.941	0.000
MPLF	13747	3578	-10169	17.611	0.000
NBP	13252	19657	6405	-5.728	0.000

Firm	Pre-	Post-	Change	t-test	Prob.
NML	1642	1352	-290	2.985	0.003
PIA	116124	175543	59418	-4.636	0.000
PIOC	1130	555	-575	7.098	0.000
POL	9935	9785	-149	0.172	0.864
PSO	13497	7525	-5972	8.834	0.000
PTCL	25960	119205	93245	-4.073	0.000
SNGP	3487	5226	1739	-3.725	0.000
SSGP	9619	6229	-3390	3.470	0.001
TELE	2021	1214	-808	4.378	0.000

Source: Authors' calculations.

Table A10: Regression analysis

Firm	Constant	Trend	Change	
AKBL	40.993	-0.025	-0.408	
	0.463	0.939	0.997	p-value
BAFL	-118.810	2.132	-441.388	
	0.199	0.002	0.016	p-value
BOP	150.024	1.498	-180.341	
	0.381	0.268	0.703	p-value
DGKC	1338.443	1.126	-826.365	
	0.007	0.566	0.169	p-value
DSFL	120.878	0.223	-74.878	
	0.134	0.408	0.336	p-value
ENGRO	410.963	0.474	-199.910	
	0.000	0.349	0.274	p-value
FABL	122.635	-0.317	113.460	
	0.027	0.236	0.106	p-value
FFBL	921.050	1.283	-207.619	
	0.011	0.489	0.704	p-value
FFC	223.358	0.664	-227.528	
	0.002	0.159	0.164	p-value
HUB	9.361	0.000	-0.135	
	0.000	0.630	0.290	p-value
IBF	96.252	-0.386	99.296	
	0.003	0.012	0.022	p-value

Firm	Constant	Trend	Change	
KAPCO	17.344	1.054	-302.285	
	0.870	0.008	0.029	p-value
KESC	41.418	1.693	-594.738	
	0.784	0.114	0.050	p-value
LUCKY	612.412	-0.351	-111.586	
	0.021	0.801	0.801	p-value
MCB	167.975	0.410	-157.663	
	0.001	0.196	0.114	p-value
MPLF	993.823	-0.611	-534.484	
	0.001	0.667	0.220	p-value
NBP	380.748	1.398	-52.548	
	0.136	0.313	0.908	p-value
NML	510.576	-0.750	106.178	
	0.000	0.248	0.479	p-value
PIA	4303.852	-4.918	3615.779	
	0.280	0.797	0.503	p-value
PIOC	46.990	-0.031	-14.587	
	0.077	0.813	0.701	p-value
POL	555.478	0.156	-21.093	
	0.029	0.896	0.940	p-value
PSO	1870.337	-0.388	-732.920	
	0.000	0.833	0.158	p-value
PTCL	-272.117	13.014	2377.395	
	0.916	0.473	0.253	p-value
SNGP	238.072	-0.255	195.716	
	0.124	0.738	0.260	p-value
SSGP	440.618	3.579	-1263.822	
	0.045	0.040	0.068	p-value
TELE	201.346	-0.020	-53.246	
	0.024	0.958	0.663	p-value

Source: Authors' calculations.

Figure A1: CARs for event study

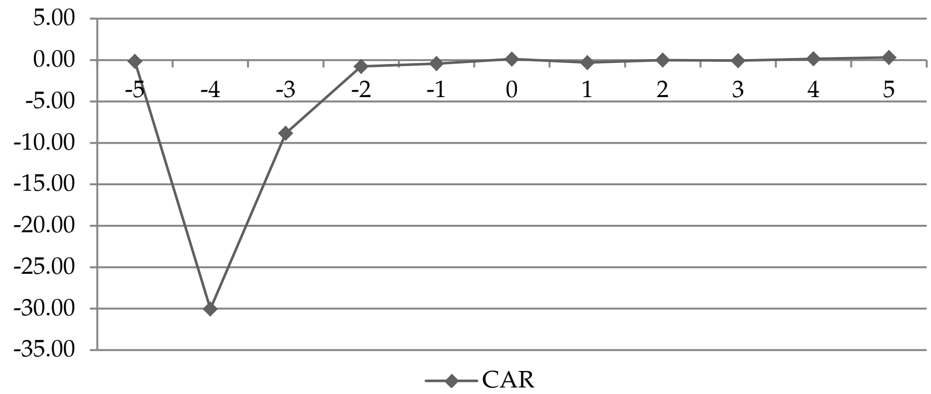

Figure A2: Volume analysis without trend

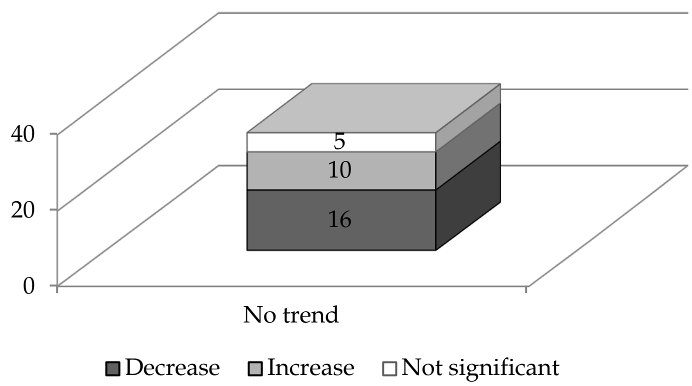

Figure A3: Volume analysis with trend