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Policy Impacts on Vietnam Stock Market: A Case of Anomalies and Disequilibria 2000-2006

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2. Strong herd effect toward extreme positive returns of the market portfolio;
3. The specification of ARMA-GARCH helps capture fairly well issues such as serial correlations and fat-tailed for the stabilized period. By using further information and policy dummy variables, it is justifiable that policy decisions on technicalities of trading can have influential impacts on the move of risk level, through conditional variance behaviors of HSTC stock returns.
4. Policies on trading and disclosure practices have had profound impacts on Vietnam Stock Market (VSM). The over-using of policy tools can harm the market and investing mentality. Price limits become increasingly irrelevant and prevent the market from self-adjusting to equilibrium.

These results on VSM have not been reported before in the literature on Vietnam's financial markets. Given the policy implications, we suggest that the Vietnamese authorities re-think the use of price limit and give more freedom to market participants.

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Policy Impacts on Vietnam Stock Market: A Case of Anomalies and Disequilibria 2000-2006

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1 An Institutional Background of Vietnam's Emerging Stock Market

Since Vietnam embarked on its extensive economic reform some 20 years ago, the country has made many important changes to turn its economy into a market-oriented one, including reforming the banking system, adding more financial components, which had never been in place before the beginning of the reform, and most recently launching its first-ever stock market as a bold move towards building a market-driven financial economy; called Ho Chi Minh City Securities Trading Center (HSTC, in short) and Hanoi Securities Trading Center (HaSTC). This study is to analyze HSTC typical stock prices, returns and volatilities, with an emphasis on impacts of policies on performance and situations of the fledgling stock market of Vietnam.

The HSTC, the major part of VSM, was born on 20-Jul-2000 as a 'pilot' market. It is subject to changes, adjustments, strict regulations, etc. The market is closely supervised by the highest executive body belonging to the government the State Securities Commission (SSC). Since 2004, SSC has become part of Vietnam's Ministry of Finance, one of the super powerhouse in Vietnam's economy. We can realize that in a highly controled economy of Vietnam, governmental policies will induce profound impacts on the performance of the market. VSM has been such a volatile market, and clearly influenced to a great extent. Policies are mainly implemented in two ways: (a) Regulatory terms; and (b) Technical requirements that the market and participants have to observe.

1.1 Listing requirements, listed firms and investors

HSTC imposes many requirements for listings, with foremost purposes of (i) ensuring the market about legality, eligibility, reasonable safety, informational efficiency; (ii) making listed firms aware of their responsibilities and benefits when joining the market; and (iii) trying to reduce unreasonable risks due to misunderstandings and lack of standards.

Listing requirements As provided by laws and guiding documents, requirements are numerous. Therefore, we will only consider here most important ones that market participants and investors should memorize.

1. Capital adequacy: HSTC stipulates that to-be-listed companies should possess a lawfully registered equity of no less than VND 10 billion.
2. Legality: Applicants must be in shareholding form; or exactly in the legal term a 'Joint Stock Company.'
3. Capital structure: Corporate capital structure is monitored closely. Major changes in the structure are reported to HTSC and SSC. A listed company should have at least 100 outside shareholders. A single individual currently can hold a maximum of 10 per cent of total equity. Foreign shareholders collectively cannot hold more than 30 per cent of total equity. Founding shareholders are not allowed to transfer shares without SSC's prior consent.
4. Profitability: An applicant firm needs to be profitable for at least two consecutive years prior to its application. This is to maintain that loss-making firms are not eligible.
5. Accounting practices and information disclosures: Companies must adopt Vietnam's Accounting Standards and be audited by SSC-authorized accounting firms. Companies who apply must make information available to the public the best way they can and in required formats: prospectus, financial statements, public releases.

6. Corporate resolves: Major decisions and resolves must be approved by corporate general shareholders meeting, annual or extraordinary, on the basis of majority votes.

Listed firms As of April 6, 2006 (trading session number 1263), the HSTC consists of 32 listed companies, with total market capitalization standing at approximately VND 28,008.5 billion; an equivalent to USD 1,761.5 million value for 370.4 million shares of all stocks. In relative terms, this value of capitalization is small, representing only about 3.45 per cent of Vietnam GDP in 2005.

Investors As reported in SSC's most recent statistics, in 2006, there were 25,000 accounts eligible for trading. Compared to the initial number of 1,471 accounts when the market started in August 2000, the increase is substantial.

1.2 Trading technicalities

Below we summarize key trading technicalities applicable to VSM, as well as the changes that took place in its history.

1.2.1 Trading mechanics

Trading days/hours: For the period from 28-Jul-2000 to 27-Feb-2002, the HSTC market had been open for three days a week, except for holidays, on Monday, Wednesday, and Friday. The trading session begins at 9:00AM and closes at 10:00AM. Since 1-Mar-2002, HSTC has applied new trading rules, following which shares of listed firms have been traded full week (5-day, from Monday through Friday), except for national holidays. New trading rules have made the following important changes:

- Trading hour is extended to 10:30AM, instead of 10:00AM.
- Orders will be matched twice per session, instead of one. In a normal trading day, the system receives order from 9:00AM. The first automated matching takes place at 9:25AM. Then all trades cease for 35 minutes, and the market resumes trading activities. The second matching takes place at 10:30AM.
- Transactions by negotiation are undertaken after 10:30AM, and go on for 30 minutes before the market closes.

Size of a round lot: Before 20-May-2003, a round lot had been defined as a set of 100 shares of the same stock. Since the date, the round lot size consists of 10 shares, with the main purpose of increasing liquidity for the individual stocks and the market.

Normal trade: Normal trade refers to the most commonly used type of trading, by which people send orders to queue in an electronic centralized system at HSTC. Sell and buy orders matching has been automated by the computer system, located at HSTC, using prioritized matching criteria, namely: (a) best price; (b) largest eligible quantity; (c) first-come-first-served; (d) individual over institutional. There will be only one close price for each stock, and this is reported as official close price of the trading session. The close level is important as the market calls it 'reference' price for the subsequent session, in which daily price limit is applicable. In normal trade, in each order the requested amount of shares for selling or buying cannot exceed 9,990 shares (990 lots).

Trade by negotiation: The second way of trade is called transaction by negotiation. This type of transaction mechanics was primarily devised to deal with larger blocks of share, that is, blocks with 10,000 shares or more. However, that primary purpose turned out to be a minor reason. In reality, investors often use this way of trading to seek different price levels from the one determined by the normal trade matching. The outcome may well be different transaction volumes at different levels of price for one stock recognized in one session.

Rules on buy/sell orders: In both trading methods, traders will use the main tool of trading orders, in two forms: buy and sell orders. A person is not allowed to write both Buy and Sell orders for the same stock in a single trading session. SSC prohibited this in late 2000 in a claim that speculators had manipulated orders by switching from Buy to Sell, and vice versa, to create mind games. Until late 2000, there had been another auxiliary type of activity allowed, called Cancellation. This was initially devised to deal with unintentional human mistakes of investors during the writing of orders. Again, this was later prohibited, due also to the claim of speculators' trick to create herd mentality.

At-the-open order (ATO): Since May 20, 2003 (S.541), the new ATO order has been introduced to the market, primarily concerned with setting investors' expectation to general market level. Using this ATO order, an investor now does not have to pre-set his/her price for an order. Instead, he or she can write the ATO, and waits to see if the order will be matched by the system, based on time priority, and volume. The closing price of the session will be applicable, if his/her order has actually been accepted by the system.

Price adjustment on ex-dividend day: The ex-dividend date has to be announced at least four weeks in advance on the HSTC daily bulletin. On the date, the reference price of the dividend paying stock is automatically adjusted downward by the equal amount of announced dividend. Daily price limit will, naturally, apply to the new reference price.

Daily price limits: Price limit change chronology is summarized in table (1). If a transaction order places prices that go beyond the limits, either upper or lower, it will be considered not eligible, and thus, rejected by the system. But prices that reach the limits are accepted.

Table 1: Chronology of daily price variation limits

Effective Date	Session	Limits	Purposes of imposition
20-Jul-2000	S.0	(+/-) 5%	To keep daily price variations at low levels.
1-Aug-2000	S.2	(+/-) 2%	To force the fluctuation even lower, with a major concern of 'possible risks' caused by overheated investors crowd in the marketplace.
13-Jun-2001	S.132	(+/-) 7%	To indicate that the market and investors are now fully aware of risk issues on the stock. To adjust for more freedom in price decisions.
10-Oct-2001	S.182	(+/-) 2%	Adjust to reduce price risks after nearly four months of recession, immediately from the market peak in Jun-01, when VN-Index reached 571 points.
1-Aug-2002	S.346	(+/-) 3%	To make the market 'more excited' after a dull trading period, despite an influx of new-listed firms.
2-Jan-2003	S.454	(+/-) 5%	No clear reasons for this adjustment. This change reflects SSC's inability to handle an emerging market in recession. It was introduced in a series of technical changes, including increasing trading hours and number of matching times.

Tick size The stock price is quoted in the local currency, Vietnamese Dong (VND). The tick size varies with the actual level of individual stock price. Table (2) gives a comparison.[1]

Table 2: Comparative tick sizes

HSTC		TSE		SET	
Price (P)	Tick size	Price (P)	Tick size	Price (P)	Tick size
$P < 20$	0.10	$P < 5$	0.01	$P < 10$	0.10
$20 \leq P < 50$	0.20	$5 \leq P < 15$	0.05	$10 \leq P < 50$	0.25
$50 \leq P < 100$	0.50	$15 \leq P < 50$	0.10	$50 \leq P < 100$	0.50
$P \geq 100$	1.00	$50 \leq P < 150$	0.50	$100 \leq P < 200$	1.00
		$150 \leq P < 1,000$	1.00	$200 \leq P < 600$	2.00
		$P > 1,000$	5.00	$600 \leq P < 1,000$	4.00
				$P > 1,000$	6.00

Informational structure The overall informational infrastructure of HSTC/SSC in general is considered a weaker point. Most frequent information that is provided by the HSCT include:

- Corporate performances
- Important changes with respect to stocks: major changes in shareholders' structure; treasury stock transactions; foreign buyers' room to invest further.
- Basic trading parameters: closing price, changes over the trading day, trade volumes, total orders, total transaction values.
- Legal changes when appropriate.

On the past 68 months By the end of our study sample, the market has experienced 45 months in operation. The following figure (1) gives an indication of market movement over time.

With a brief overview of the market in general sense, and before we move on, there are a few points worth mentioning:

- Vietnam's stock market was born during the nation's transition process to the market economy;
- Impositions such as limits on price have large impact on price and return behaviors, in both theories and practice; and,
- There were technical changes throughout our sample, which theoretically can produce significant changes in stock time series behavior, such as stock splits, changing in round lot size, etc.

2 Data Sets and Literature Review

Two types of price that we look at are individual stock prices, and market general price index. For the individual ones, we consider 10 different stock close prices. The only market general price index is the Vietnam Index (VNI).

[1] VSM tick size in unit of VND 1,000; Taiwan (TSE), NT$ 1.0; Thailand (SET), Baht 1.0.

2.1 The Data

Dividend The practice on the HSTC is that dividend is usually paid once or twice a year. In case, an annual dividend amount is paid twice, the first dividend payment is usually in the 3rd quarter of the current year, and the amount is computed based on predicted annual net profits from unaudited quarterly financial reports. The second payment is made in the first quarter of the next year, based on the year's audited financial reports, and actual decision of the Board of Directors.

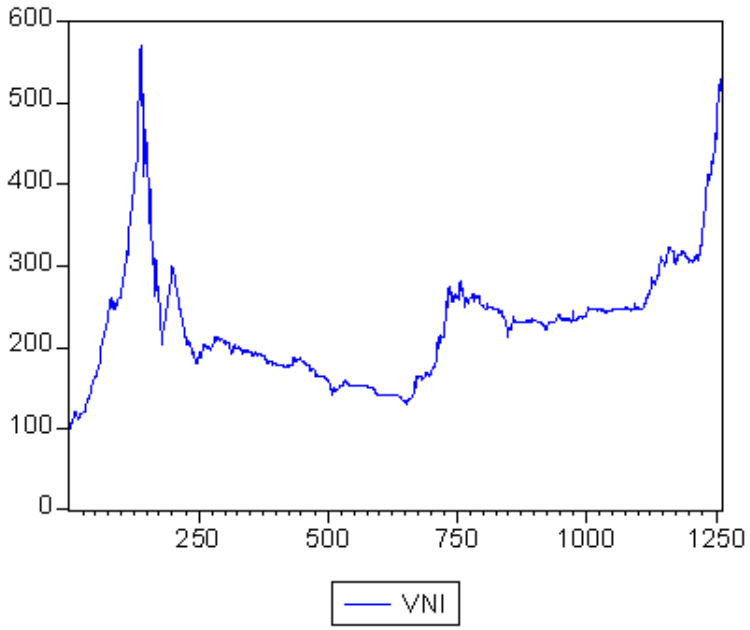
Daily stock returns The definition of daily returns is given by eq.(1)

$$r_t = \ln(P_t + D_t) - \ln P_{t-1} \tag{1}$$

where P_t is the current session close price; D_t dividend; and P_{t-1}, the preceding close price. D_t appears on the ex-dividend day, when the reference price is reduced automatically by the exact amount of dividend, because this drop is in no relation to actual performance of dividend-paying stock.

Exogenous variables Exogenous variables in our models comprise of several most important information obtained from the market releases and official sources of information, such as central newspapers, media and the authorities' announcements, corporate audited releases are an important source.

Figure 1: VN-Index



2.2 A Note on Relevant Literature

With regard to Asian emerging equity markets, Pyun *et al.* (2000:[8]) describe the relation between changes in stock volatility and information flows through stock markets, and Berkman and Lee (2002:[1]) for impacts of technical rules, such as price limits on general market behavior.

Our particular region of interest (Southeast Asia) is also studied in Malliaropulos and Priestley (1999:[7]). However, very few such studies about Vietnam markets are available for references. Farber [4] cites to the phenomenon of possible serial correlation when looking at prices and returns series. Su and Fleisher (1998:[9]) studies particularly the pattern of risk and return behaviors in Shanghai and Shenzhen markets. A noteworthy point is their consideration of daily price-change limit as a policy dummy variable. This information is particularly useful because such a direct intervention should generate profound changes in stock return dynamics.

2.3 Market indication

VSM has been operational for about 68 months. We will be using data subsample for the first 800 trading sessions, which ends early May 2004. The market basic information is provided in table (3).

Table 3: The number of listed firms over time

	2005	2004	2003	2002	2001	2000
Number of companies	32	24	21	20	10	5
Total Market Cap.	28,008	4,224	2,190	2,843	2,277	1,037

The co-moving trend The co-moving trend is considered typical for stocks listed on VSM. Next, we summarize the pairwise correlation coefficients for 14 stocks and VNI, which is defined in eq.(2):

$$\text{corr}(X,Y) = \frac{\sum_{i=1}^{n}(x_i-\mu_x)(y_i-\mu_y)}{\left[\sum_{i=1}^{n}(x_i-\mu_x)^2(y_i-\mu_y)^2\right]^{1/2}} \tag{2}$$

The correlation matrix is given in table (4).

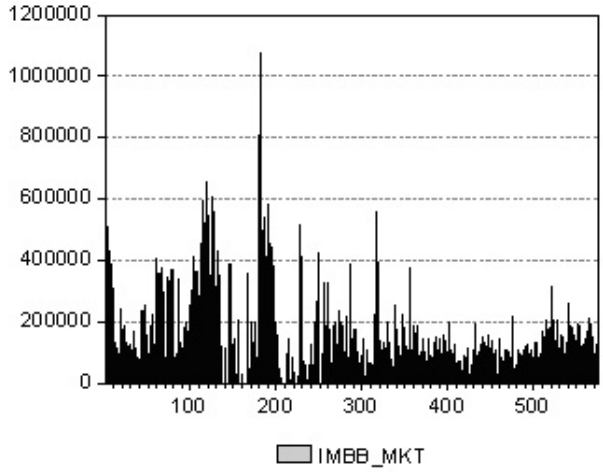
Table 4: Correlation coefficients matrix for daily returns

	BBC	BPC	BT6	BTC	CAN	DPC	GIL	HAP	LAF	REE	SAM	SGH	TMS	TRI	VNI
BBC	1	.3969	.5510	.2104	.3970	.4177	.3989	.4353	.3355	.5637	.5218	.3707	.4421	.4156	.6539
BPC	.3969	1	.4281	.2307	.4201	.3182	.3563	.3457	.3572	.4392	.4076	.2111	.3932	.3764	.5524
BT6	.5510	.4281	1	.1711	.4019	.3671	.5317	.5260	.4536	.5970	.6351	.3091	.5401	.4861	.7609
BTC	.2104	.2307	.1711	1	.1569	.1742	.1502	.1356	.1548	.2070	.1502	.0468	.2013	.1165	.2422
CAN	.3970	.4201	.4019	.1569	1	.4142	.3212	.3777	.3628	.4905	.4307	.3253	.3927	.3998	.5749
DPC	.4177	.3182	.3671	.1742	.4142	1	.3946	.3341	.2972	.4554	.4361	.3061	.3876	.3268	.5328
GIL	.3989	.3563	.5317	.1502	.3212	.3946	1	.3826	.3395	.4956	.4911	.2675	.4607	.4285	.6224
HAP	.4353	.3457	.5260	.1356	.3777	.3341	.3826	1	.4791	.5906	.5967	.2960	.5498	.3886	.6780
LAF	.3355	.3572	.4536	.1548	.3628	.2972	.3395	.4791	1	.5801	.5564	.3930	.6249	.3566	.6679
REE	.5637	.4392	.5970	.2070	.4905	.4554	.4956	.5906	.5801	1	.7413	.4092	.7261	.4513	.8997
SAM	.5218	.4076	.6351	.1502	.4307	.4361	.4911	.5967	.5564	.7413	1	.4076	.6665	.4275	.8948
SGH	.3707	.2111	.3091	.0468	.3253	.3061	.2675	.2960	.3930	.4092	.4076	1	.3781	.2968	.4803
TMS	.4421	.3932	.5401	.2013	.3927	.3876	.4607	.5498	.6249	.7261	.6665	.3781	1	.4114	.7942
TRI	.4156	.3764	.4861	.1165	.3998	.3268	.4285	.3886	.3566	.4513	.4275	.2968	.4114	1	.5843
VNI	.6539	.5524	.7609	.2422	.5749	.5328	.6224	.6780	.6679	.8997	.8948	.4803	.7942	.5843	1

We realize that all coefficients shown in the matrix (4) have positive values. So they show a tendency of co-moving in one direction. Naturally, some pairs of stocks co-move much closely than others, such as two large firms REE and SAM, +.74; or REE and Transimex (REE-TMS): +0.73.

Imbalances Although we did mention buy and sell orders volumes previously, it is now time to mention order imbalances. There are several ways to define the degree of imbalance caused by unmatched orders existent in the system during each trading session. First, we can take the difference between total buy orders and actual realized volume as imbalance; let us call it buy-side imbalance (we name this variable by adding IMBB_ to a stock code; e.g. buyside imbalance of REE is named IMBB_REE, and so on). Second is the sellside imbalance, as the difference between total sell order and actual volumes. The third is difference between total sell and buy orders volume. All these are computed for one trading session. To eliminate the complication of minus (−) versus plus (+) sign during the difference taking, we may also use absolute value to only count the magnitude of the imbalance, no matter (−) or (+). We observe these imbalances for the aggregate market volumes in the graphs (2) below.

Figure 2: Aggregate market buyside imbalances: S.1-574



The situation is strange because order imbalances are positive on both sides in the same transaction day. This problem happens because many different price levels for orders are entered into the system *call auction periodic orders matching*, but only one will be selected by each orders matching, leaving the rest unmatched and recorded as imbalance in the aggregate. It turns out at the end of the session that only 'best' (this term is confined to the set of known priorities only) orders, leaving a large number of both buy and sell orders unrealized.

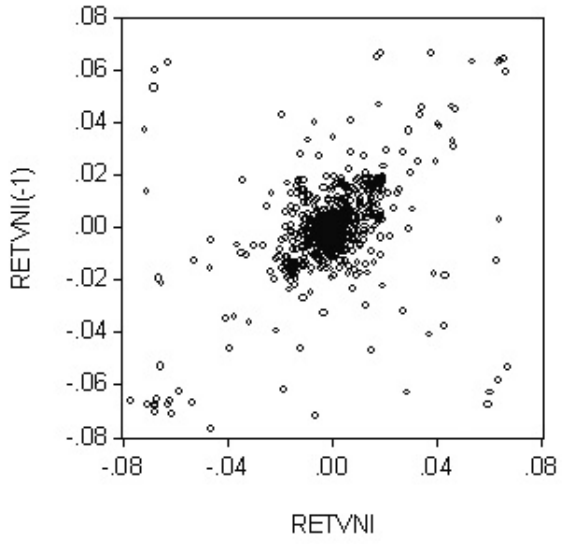
3 An Analysis of Stock Properties and Anomalies

3.1 The analysis and empirical results

3.1.1 Limit-hits and strange distributions of returns

Clusters of returns: the index and individual stocks The following graphs (3,4,5) will demonstrate some strong clusters of market and individual returns in critical periods of time. We can check out here the mapping of a specific return value with its preceding value on a plane.

Figure 3: Clusters of daily market returns



These share similar patterns of clustering, where data points are clustered in several distinct areas. It appears that many points are symmetric over the straight line that equalize the first quadrant of the plane. Further, the patterns of data locations even look closer between individual stock returns, by comparing (4) and (5).

Apparently, many clusters are found in the neighborhood of meaningful points that have the coordinates of the form $(x, x); (-x, x); (x, -x); (-x, -x)$, where x is the daily price limit applicable for each period of time (2,7,2,3,5%). We can also see that many other points reaching the limit of the corresponding period, forming squares. The shape suggests that in many trading session the stock, and even the index, hits the limit. It does not only hit the limit, but hits it repeatedly in continous trading sessions. In some other situations, after hitting the upper limit, the price subsequently hits lower limit. The sequence of limit-hits can also be long, forming thick clusters of data points at corners of the squares on the plane constructed by applicable market limits. We found that many other stocks exhibit similar characteristics.

Observation of limit-hits The situation of individual stocks in terms of limit-hits is summarized in table (5), where 12 stocks are considered and columns show the subsamples, in which we count the number of hits to (a) either limit; (b) upper limit only; and (c) lower limit only. These

Figure 4: Clusters of daily REE returns

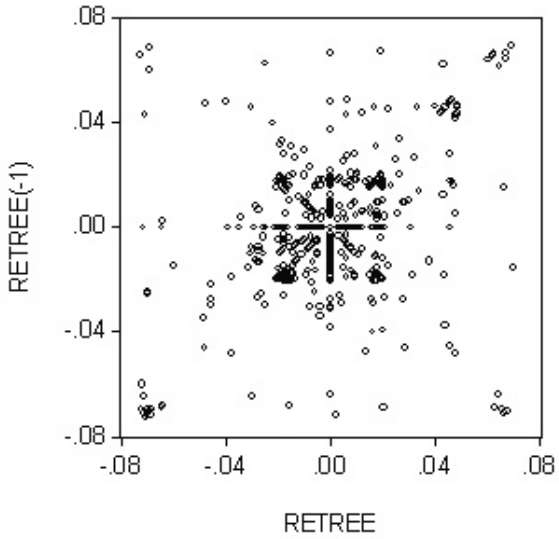
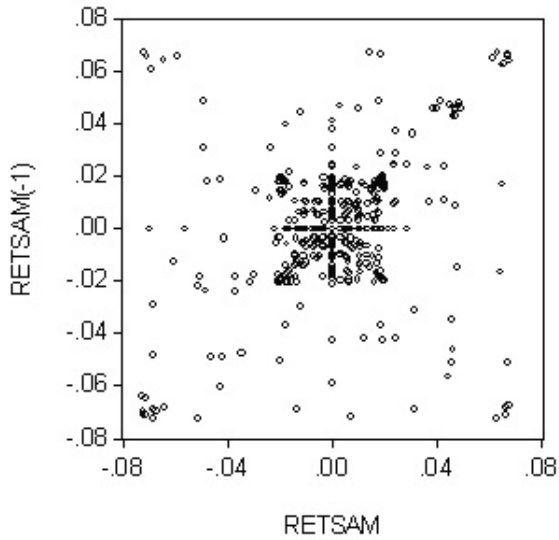


Figure 5: Clusters of daily SAM returns



are provided for the first period of nearly 800 trading sessions of HSTC.[2]

Table 5: Summary of limit-hits for 12 stocks

Subsample	S.277	S.327	S.377	S.427	S.477	S.527	S.577	S.627	S.677	S.727	S.777
HITBBC	42	56	71	73	76	76	77	80	84	90	92
HITBTC	32	44	61	74	86	100	107	107	107	116	122
HITCAN	66	84	93	97	100	103	103	107	110	114	119
HITDPC	47	68	78	88	93	93	93	93	100	105	107
HITGIL	28	46	55	56	58	61	61	63	71	79	86
HITHAP	212	224	233	233	234	237	237	238	243	248	259
HITLAF	175	198	211	217	225	226	226	227	233	238	243
HITREE	236	257	264	266	269	273	273	273	279	285	290
HITSAM	222	236	242	242	242	244	244	244	249	254	260
HITSGH	106	125	133	139	146	148	152	156	161	168	170
HITTMS	209	225	234	234	238	241	243	243	247	253	258
HITTRI	34	47	60	69	73	76	76	76	76	82	90
Subsample	S.277	S.327	S.377	S.427	S.477	S.527	S.577	S.627	S.677	S.727	S.777
HUBBC	18	24	28	30	33	33	33	35	38	43	45
HUBTC	19	22	28	33	40	46	48	48	48	52	55
HUCAN	15	23	26	26	28	30	30	32	34	37	41
HUDPC	10	17	21	25	28	28	28	28	31	33	34
HUGIL	16	28	33	33	34	35	35	35	40	46	50
HUHAP	170	176	181	181	181	183	183	184	187	191	197
HULAF	110	119	124	129	135	135	135	135	138	142	145
HUREE	151	164	166	166	168	170	170	170	175	180	184
HUSAM	143	152	157	157	157	158	158	158	161	165	170
HUSGH	54	60	62	64	68	68	70	73	77	80	81
HUTMS	146	155	159	159	161	163	164	164	167	172	175
HUTRI	14	19	24	28	30	32	32	32	32	37	44
Subsample	S.277	S.327	S.377	S.427	S.477	S.527	S.577	S.627	S.677	S.727	S.777
HDBBC	24	32	43	43	43	43	44	45	46	47	47
HDBTC	13	22	33	41	46	54	59	59	59	64	67
HDCAN	51	61	67	71	72	73	73	75	76	77	78
HDDPC	37	51	57	63	65	65	65	65	69	72	73
HDGIL	12	18	22	23	24	26	26	28	31	33	36
HDHAP	42	48	52	52	53	54	54	54	56	57	62
HDLAF	65	79	87	88	90	91	91	92	95	96	98
HDREE	85	93	98	100	101	103	103	103	104	105	106
HDSAM	79	84	85	85	85	86	86	86	88	89	90
HDSGH	52	65	71	75	78	80	82	83	84	88	89
HDTMS	63	70	75	75	77	78	79	79	80	81	83
HDTRI	20	28	36	41	43	44	44	44	44	45	46

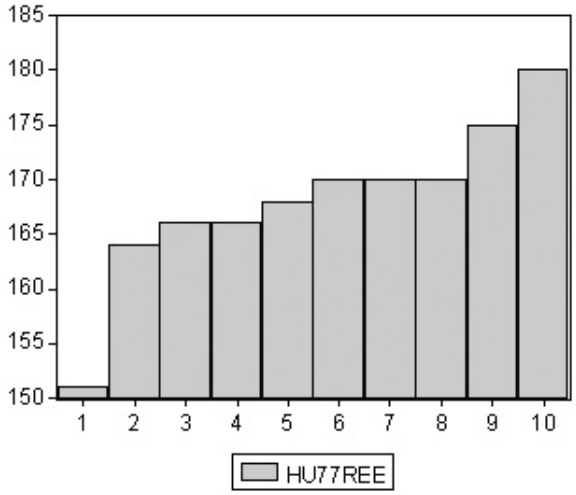
Subsamples are expanded gradually with time increament of 50 trading sessions. The exception is the first subsample, the single largest, from S.1-277. This first subsample is designed that way to incorporate many new stocks listed during the period. We can recognize that in the early stage of the market, limit-hits happened more frequently. The older the stock, the higher number of limit-hits that has in the table, for instance, REE, SAM, HAP, TMS, and LAF, the first five stocks on the HSTC show a large number of limit-hits, on average about 250 hits over the total number of data point roughtly 780. Taking these five, clearly 32 percent of the time, these stocks hit the limits, one side or the other, representing the fact that in a substantial amount of time, the HSTC has always been in disequilibrium.

Taking REE only, we compare this 32 percent to Taiwan Stock Exchange (TSE), as reported in Huang *et al.* (2001:[6]). For a longer period of time 1990-96, TSE is considered one of striking market with large number of prices hitting limits, besides Thailand SET. [6] reported 8,938 lower limit-hits and 11,138 upper. This shows the HSTC has been phenomenal in terms of sustaining

[2]All subsamples start from trading session number 1, that is, S.1. The figure inside indicates the number of hits to the type of limit during the period spanning these trading sessions. Variable with prefix HIT represents total hits to either limit; HU, hits to the upper; HD to the lower.

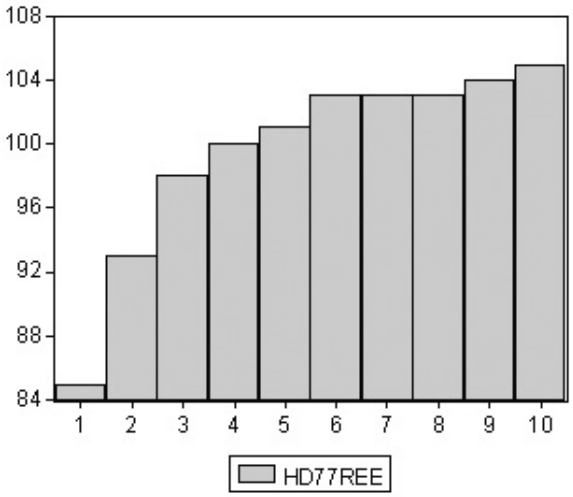
disequilibrium; the point raised in [5]. We will take the *veteran* REE as an example, to see distribution of limit-hits over time. Overall, REE has the most hits to either limit over the entire sample of study. The empirical CDF is provided in figure (6).

Figure 6: Empirical CDF of REE hitting upper limits



REE limit-hits accumulated very quickly. Then the number of hits reduced quickly and total upper hits did not increase much over a long period. In the most recent period, the phenomenon has re-emerged. The same situation with the lower limit, as shown in fig.(7).

Figure 7: Empirical CDF of REE hitting lower limits



This distribution over time has a close link to the investment sentiment. Attitude toward investing of investors on HSTC, have generally been unstable. Sometimes they rushed to buy on many consecutive days, pushing the price constantly to the upper limits. Other times, investors rushed to sell, making the price dive to the lowers. Naturally, by adding up these two similar CDF, the CDF for total hits to either limit will again share the similar shape.

Sequences of hits Our understanding about the HSTC and many of its stocks is that the price formation process has been highly regulated by the limits. The limits generate impacts on stock prices not only on one trading session, but many, and also many sessions in a row. The fact that stock prices keep reaching out either limit is an evidence that the demand and supply are not equal, leaving imbalance open at the end of a trading session. When the sequence of hits, to either side, becomes a long one, the disequilibrium sustains. Here we show the situation on Vietnam's HSTC, presenting table (6).

Table 6: Summary of limit-hits sequences for 6/24 individual stocks

HAP	TMS	REE	SAM	LAF	SGH
127	5	23	13	64	10
7	28	4	6	6	7
3	27	3	7	5	4
3	19	53	14	6	5
2	18	17	40	3	31
2	6	16	33	4	12
2	8	2	3	10	5
2	2	3	2	2	15
17	4	3	13	7	8
4	7	3	2	24	2
2	2	4	39	9	3
2	15	10	2	6	3
10	10	56	10	3	3
6	7	11	27	2	3
13	6	7	2	3	3
3	18	8	3	7	5
2	19	3	4	2	2
2	2	2	2	7	3
2	2	10	3	2	5
3	3	8	2	3	2
2	2	3	5	2	2
4	2	3	4	2	2
2	2	2	2	8	2
	4	2		2	
	4	3		5	
	3	2		2	
	2	2		3	
	5	4		2	
	2	2		5	
				3	
				2	

Sequences are built from continuous hits to either limit, upper or lower. Single limit-hits are eliminated from the statistics drawn on the subsample of 778 trading sessions. The lengths of sequences are very different. Some are fairly short, 2 or 3 consecutive hits, but some very long, upto 127 consecutive trading sessions (two thirds of a year) as the case of HAP in the early days of the HSTC. This is very striking. The price limit did keep the price from moving up or down according to expectations of the market. Instead, the price constantly reached the limit to find its stable point rest there. This is phenomenal because the market failed to adjust the price to the demand-supply relation, and thus, agreed to stay at either limit applicable for long.

Concerted limit-hitting patterns The above discussions have shown that limit-hits are really a phenomenon that may be more telling than just the simple notion of reaching to some price level. With many sequences of different lengths of hits, another question is whether there exists a pattern of concerted limit-hits among a group of stocks, which at the same time reach the price limit in the same direction. The following focus on this aspect of this phenomenon of the HSTC. Because it is not rational to expect that all stocks will behave the same way, even if the phenomenon of limit-hits has been shown quite frequent, five long-standing stocks on HSTC (REE, SAM, HAP, TMS, and LAF) will be selected make a study on this aspect. An intuitive approach is used in processing the data here. The group of stock prices could a show strong, weak or no consensus, in terms of limit-hits by closing, by the following interpretations.

1. Strong consensus: All stocks have their prices hitting the same limit on the same day, with only one exception of one stock that does not hit that limit. However, this stock should hit the opposite limit;

2. Weak consensus: At least half of the stocks hit the same limit, while no others hit the opposite limit; or all hit the same limit, except one that hits the opposite limit; and,

3. No consensus: Situations that do long fall in the two types of consensus above.

The total sample was divided into 10 equal subsamples, for each of them, hit consensus is recorded. If both strong and weak types are grouped into a unique category of consensus, showing concerted limit-hits within the group 5, we see the depth of the phenomenon over study sample, by figure (8).

Figure 8: Concerted limit-hits by equally-divided subsamples

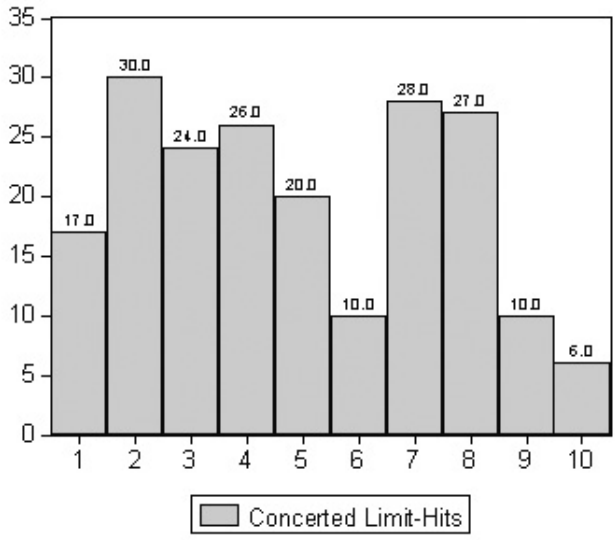
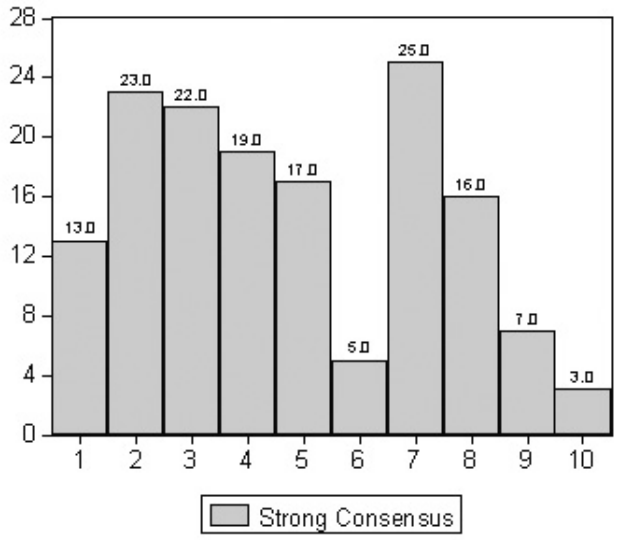


Figure (8) indicates that the general level of concerted limit-hits has been very high within this group 5. With small subsample of less than 80 sessions, number of concerted hits run from 6 to 30 times; or 7.7 and 38.5 percent of the times. The concerted move to limit has been less critical recently, but not been eliminated. This situation gives rise to the issue of herd behavior on Vietnam stock market, although so far, a study of only 5 stocks does not suffice to conclude.

Next, fig.(9) shows the narrower category of strong limit-hit consensus, so that we can see whether with a more strict definition of consensus, the situation could be much less critical. However, the situation of strong consensus in hitting price limits can still be seen very clear, with number of hits running from 3 to 25.

Figure 9: Strong limit-hit consensus by equally-divided subsamples



3.1.2 The herd behavior on HSTC

This concentrates on finding the evidence of the herd behavior among investors. In the view of this study, the herd behavior is referred to as: *the actions of trade by which individual suppress their own beliefs, expectations, information, and base their investment decisions solely on the collective actions of the market.* By this, individual security returns will not deviate too far from the overall market level. In presence of strong herd behavior, smaller deviations from the market return likely lead to two situations, as provided by Christine and Huang (1995:[3]). One, return dispersion grows at decreasing rate. Two, the dispersion decreases if the herd is severe. This idea leads to the cross-sectional standard deviation (CSSD) specification, and relevant data treatment in what follow.

CSSD specification and the adjusted HSTC data [2] describes the modality of CSSD method in considering the herd behavior evidence. The cross-sectional standard deviation (CSSD) is defined for the portfolio by eq.(3).

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N}(r_{it} - r_{Mt})}{N-1}} \tag{3}$$

where r_{it} is a return of stock i on the day t, and r_{Mt}, an aggregate (market) portfolio return on t. r_{Mt} here represents a weighted market return of all individual returns of the day, equally

probable. Therefore, we will redo the calculation of market returns, and do not use the VNI, whose weights are corresponding number of outstanding shares on the HSTC. Naturally, CSSD measures the average proximity of individual returns to the realized average; the dispersion.

In the presence of herd behavior, the $CSSD$ measure will help examine whether the dispersions are significantly lower than than average during the extreme moves of the market in consideration, using the empirical specification given by eq.(4) (see [3, 2]).

$$CSSD_t = \alpha + \beta^L D_t^L + \beta^U D_t^U + \epsilon_t \tag{4}$$

where both D_t^L, D_t^U are dummy variables, defined in the following ways. $D_t^L = 1$ if the (market) portfolio return is in the extreme lower tail of the empirical distribution, otherwise, 0. $D_t^U = 1$ if the portfolio return is in the extreme upper tail, and $D_t^U = 0$ otherwise.

Here comes an issue on the data used. [3] suggests the use of 5 percent lower and upper tails of the empirical return distribution for D^L, D^U, however, things do not work out this way for the HSTC, due to largely to the existence of daily price limits, and frequent limit-hits. Instead, this study defines extreme returns, downside and upside, by comparing to price limits applicable in corresponding periods. If a positive return is from 70 percent and above, $D_t^U = 1$. Similarly, a negative return is equal to or lower than -70 percent, then $D_t^L = 1$. For instance, taking the market portfolio, which consists of all stocks available on day t, we find 46 points where $D_t^L = 1$, and 130 points where $D_t^U = 1$. The simple model explains that in the presence of herd behavior, at least one of β^L, β^U should be statistically significant. In addition, the correct signs are *minus*. Negative β^L means the investors herd around the market performance when the return trend is extremely negative, the downside; and, negative β^U, the upside. Positive β's will mean a contradiction. Results of our study for Vietnam stock market are presented in the following.

Results of CSSD herd analysis Figure (10) unveils the CSSD for the market index over the sample, which we see in some periods varies substantially.

The CSSD for a subsample from S.200-300 exhibits an apparent downward trend. The task of detecting components that explain the trend in this period, among others, is performed using model (4). In table (7), besides the market return, several smaller portfolio returns are computed for 5, 10, and 15 stocks. The effect of herd behavior on these returns is also checked.

The results reported in table (7) give us the following insights:

1. All specifications show statistically significant β^U, with correct (negative) signs. Thus, investors behave in herd when the market situation forces the stocks to extreme positive returns.

2. Two specifications also show the investors of the group of the first 5 and 10 stocks of HSTC herd around the general downward trend of these 5, and 10 stocks, with β^L being significant, at 10 and 1% levels, respectively. Both carry the correct (negative) sign.

3. Considering the case of market portfolio (equally-weighted), the absolute magnitude of decreasing rate of CSSD, caused by β^U, is fairly strong, standing at 0.01105, comparing to the mean level of $CSSD$, 0.012343.

4. Other specifications show $|\beta^U|$ running from 0.004 to 0.009. In general, when β^L is statistically significant, $|\beta^U| > |\beta^L|$.

Figure 10: Cross-sectional standard deviation

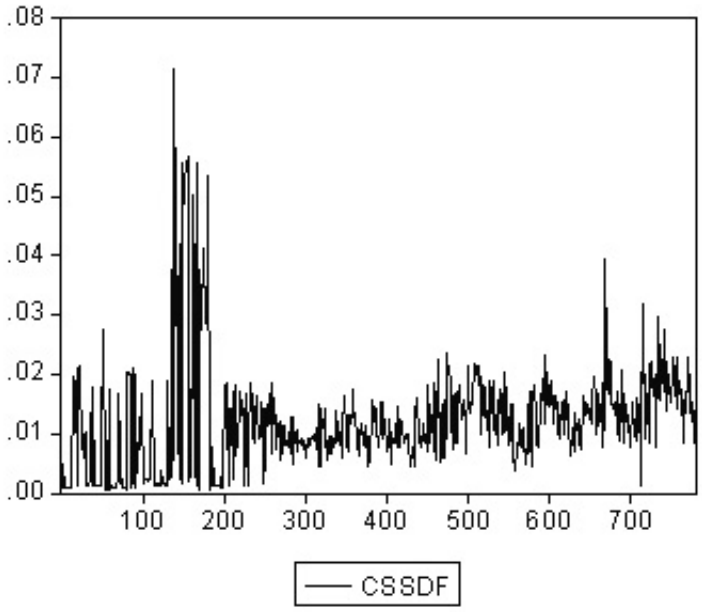


Table 7: Empirical specifications on market herd behaviors

	Market portfolio: all stocks available		
	Sample: 2-778		
	α	β^L	β^U
Coefficient	0.01428	0.001074	-0.011053
t-Stat.	43.1461$\star$	0.52811	-22.48061$\star$
	Portfolio of 5, equally-weighted		
	Sample: 62-778		
	α	β^L	β^U
Coefficient	0.011945	-0.002308	-0.009161
t-Stat.	30.81991$\star$	-1.68989$\star\star$	-16.45311$\star$
	Portfolio of 10, equally-weighted		
	Sample: 218-778		
	α	β^L	β^U
Coefficient	0.012371	-0.003427	-0.005224
t-Stat.	53.64082$\star$	-3.072163$\star$	-3.919996$\star$
	Portfolio of 15, equally-weighted		
	Sample: 278-778		
	α	β^L	β^U
Coefficient	0.012784	-0.001581	-0.003978
t-Stat.	55.17681$\star$	-0.834214	-3.402168$\star$
$\star, \star\star, \star\star\star$: statistically significant at 1, 5, 10% levels, respectively.			

By these results, we come to the understanding that herd behaviors do exist on the HSTC. Its impact is not small. Since the extreme returns, both negative and positive, in our consideration are clusters of returns around the upper and lower daily price limits, the empirical results suggest that the limit plays a significant role in the herd behavior among HSTC investors; a non-trivial insights.

3.1.3 Exogenous variables in the system

This takes into consideration exogenous variables to examine whether they can help explain what happen with the stock market. The additional introduced into the modeling of both mean and variance equations include several groups as described below:

1. Daily price limits: These apply to all time series in considerations, with changes over time as mentioned in early sections.

2. Market and individual volume imbalances (realization, buy orders, and sell orders).

3. Technical and rules changes and other market and related corporate news, all reflected by dummy variables, in binary relation (0 or 1).

With these new variables in the model, the general representation of regression systems will have the following form:

$$\begin{array}{rcl} r_t & = & C + \sum_{i=1}^{m} \phi_i r_{t-i} + \epsilon + \sum_{j=1}^{n} \theta_j \epsilon_{t-j} + \sum_{k=1}^{o} \zeta_k y_k \\ \sigma_t^2 & = & \kappa + \sum_{v=1}^{p} \alpha_v \sigma_{t-v}^2 + \sum_{w=1}^{q} \gamma_w \epsilon_{t-w}^2 + \sum_{l=1}^{s} \zeta_l y_l \end{array} \tag{5}$$

In table (8), estimation details are provided for the dynamics represented in the above system (5). To save space, only first four stocks and the market index estimations are in the table. Because most important information were released within the first 500 trading session, this consideration takes a subsample from trading session 100 to 475, containing major market changes of conditions of the subsample 778 sessions, while eliminating early stage of strong herd behavior. Also, all different phases of daily price limit adjustments are within this subsample.

Table 8: GARCH estimations with exogenous variables for returns

Params.	HAP		REE		SAM		TMS		VNI	
MEAN EQUATION										
C	0.049849		0.207694	*	-0.065792	**	1.15×10^{-1}	*	0.118233	*
s.e.	0.032179		0.040572		0.032356		0.044459		0.031879	
zStat	1.549123		5.119142		-2.03337		2.587208		3.708773	
AR(1)	0.005598		0.09348	**	-0.124411		-0.072185		0.128715	**
s.e.	0.054847		0.051123		0.079752		0.05476		0.060351	
zStat	0.102071		1.82852		-1.559984		-1.318202		2.132776	
Band(-1)	-0.048476		-0.202526	*	0.064499	**	-0.112064	*	-0.115971	*
s.e.	0.031255		0.039395		0.031394		0.043159		0.030868	
zStat	-1.55097		-5.140882		2.054518		-2.596555		-3.757059	
RRMKTV	0.000674		0.000914		–		0.000889		0.000865	***
s.e.	0.000474		0.000796		–		0.000729		0.000468	
zStat	1.421064		1.148374		–		1.220043		1.848743	
RRVNI	1.061441	*	–		1.074173	*	0.782347	*	–	
s.e.	0.025937		–		0.061068		0.057865		–	
zStat	40.92312		–		17.5899		13.52015		–	
MktIMB	–		–		–		–		-4.28×10^{-8}	*
s.e.	–		–		–		–		2.59E-09	
zStat	–		–		–		–		-16.53813	
IndIMB	1.22×10^{-8}		-9.98×10^{-8}	*	–		-3.81×10^{-8}	**	–	
s.e.	2.10×10^{-8}		6.29E-09		–		1.69×10^{-8}		–	
zStat	0.580582		-1.59E+01		–		-2.248017		–	
MktDG	0.000467		0.009287	**	-0.006093	*	0.000819		0.008485	**
s.e.	0.001736		0.004616		0.002323		0.002608		0.003481	
zStat	0.269213		2.011772		-2.622597		0.313949		2.437547	
REESpl	–		0.007855	***	-0.002016		0.003761	***	-0.016637	*
s.e.	–		0.004413		0.003944		0.002298		0.000969	
zStat	–		1.779939		-0.511079		1.636519		-17.16655	
SAMSpl	–		–		-0.002123	***	-0.020369	**	0.037759	
s.e.	–		–		0.001256		0.008753		0.029906	
zStat	–		–		-1.690144		-2.327154		1.262593	

Table 9: GARCH estimations with exogenous variables for return rates - group 1 cont'd.

Params.	HAP		REE		SAM		TMS		VNI	
VARIANCE EQUATION										
κ	-3.27×10^{-6}		-1.05×10^{-5}		6.64×10^{-6}		-8.10×10^{-6}	$\star$	1.72×10^{-6}	
s.e.	8.41×10^{-6}		1.77×10^{-5}		8.69×10^{-6}		2.43×10^{-6}		9.04×10^{-6}	
zStat	-0.388626		-5.91×10^{-1}		0.764771		-3.333118		0.189850	
ARCH(1)	0.145277	$\star$	0.244372	$\star$	0.238878	$\star$	0.342145	$\star$	0.264692	$\star\star$
s.e.	0.055166		0.05946		0.087571		0.089641		0.109623	
zStat	2.633464		4.109867		2.727833		4.720454		2.414580	
GARCH(1)	0.596518	$\star$	0.574743	$\star$	0.669524	$\star$	0.590626	$\star$	0.543867	$\star$
s.e.	0.116237		0.129125		0.08363		0.069109		0.164858	
zStat	5.13189		4.451044		8.005798		8.54635		3.299006	
BBCDB	-2.70×10^{-5}	$\star\star$	-6.58×10^{-5}	$\star\star$	-1.30×10^{-5}	$\star\star$	5.66×10^{-6}		-5.51×10^{-5}	$\star$
s.e.	1.37×10^{-5}		3.74×10^{-5}		5.81×10^{-6}		3.24×10^{-5}		1.38×10^{-5}	
zStat	-1.967906		-1.757973		-2.244237		0.174984		-3.986807	
CANDB	3.89×10^{-5}		-2.26×10^{-5}		–		-2.16×10^{-5}	$\star$	2.41×10^{-5}	
s.e.	5.79×10^{-5}		1.68×10^{-5}		–		6.13×10^{-6}		4.06×10^{-5}	
zStat	0.672484		-1.34545		–		-3.524398		0.594811	
MKTDB	-1.43×10^{-5}	$\star\star$	-1.33×10^{-5}		–		2.43×10^{-5}		-8.36×10^{-6}	
s.e.	6.68×10^{-6}		1.89×10^{-5}		–		3.86×10^{-5}		9.03×10^{-6}	
zStat	-2.136521		-0.702134		–		0.628414		-0.926465	
BANDN	0.000656		0.001479		9.27×10^{-5}		0.00062	$\star$	0.000434	
s.e.	0.000429		0.001108		0.000198		5.04×10^{-5}		0.000512	
zStat	1.530014		1.33445		0.467879		12.29297		0.848341	
REESpl	5.64×10^{-6}		3.71×10^{-5}		–		–		–	
s.e.	3.47×10^{-5}		7.42×10^{-5}		–		–		–	
zStat	0.162578		0.500323		–		–		–	
SAMSpl	-6.94×10^{-5}	$\star$	–		–		–		–	
s.e.	2.38×10^{-5}		–		–		–		–	
zStat	-2.912338		–		–		–		–	
LogL	1634.182		1394.423		1634.947		1488.437		1587.471	

The table below reports statistics of the modeling using the above table (8) specification for each time series.[3]

Table 10: GARCH estimations statistics for table (8)

Params.	HAP		REE		SAM		TMS		VNI	
LogL	1634.182		1394.423		1634.947		1488.437		1587.471	
AIC	-6.827773		-5.828426		-6.83346		-6.208594		-6.647556	
Engle LM	0.245652		1.607746		0.026511		0.952267		0.295426	
JB	232.8	$\star$	31.3	$\star$	1987.7		44.8	$\star$	611.2	$\star$
$Q'(6)$	4.2502		11.562	$\star\star$	8.7602		6.5005		10.490	$\star\star\star$
$Q'(12)$	7.196		15.014		19.432	$\star\star\star$	11.34		13.579	
$Q'(36)$	30.473		38.402		46.223		40.69		41.884	
$Q^{2\prime}(6)$	5.5584		2.5107		14.843	$\star\star$	2.7316		2.0256	
$Q^{2\prime}(12)$	9.3026		6.4103		17.799	$\star\star\star$	10.672		7.7588	
$Q^{2\prime}(36)$	32.367		13.633		39.403		27.467		23.099	

From tables (8,10), we can observe that the entering of exogenous variables into the systems has changed the dynamics significantly. Most of the autoregressive coefficients for rates of returns in the previous pure ARMA-GARCH estimations have become irrelevant, and their difference form zero is decisively rejected by the new specifications. Instead, exogenous variables, including dummy, come in as explanatory powers in different ways, between different time series.

[3] $\star$,$\star\star$,$\star\star\star$ denote significance at 1, 5, and 10 percent level, respectively. $Q^{2\prime}(k)$ represents Q-test statistic values for squared standardized residuals of the mean equation, while Q_k represents Q-stat. for standardized residuals. Engle's LM is test statistic for further ARCH effect with residual time series.

Specifically, we have used the most influential variables that provide much of the market information contents over the history of the HSTC. Variables with suffix *spl* represents information on stock split (e.g., REEspl refers to the split of REE stock at ratio 1:1.5 in October 2002). Variables with suffix DB refers to bad information on the stocks themselves, and *DG* to good news on earnings, personnel changes, technical performances, etc. BAND refers to the highest rates of returns subject to daily price limits, such as 1.02 when the limit is 2 percent per day for stock price change. BANDN refers to the positive side of the limit itself, e.g., the exact 2 percent. RRMKTV is the growth rate over a session in total market realization volume, and RRVNI is the rate of return of the market index. We notice that not all informational contents of all stocks have been entered into the estimations. We carefully select only stocks with most important information, which are believed to make abrupt changes in the marketplace. They are BBC with substantial information on delinquent reports, loss coverups, and conflict within the Board of Directors; CAN with the case of VAT tax fraudulents, in which several key personnel have been arrested by the economic police; REE with information on consolidating accounting practices, unexpected drops in profits, inefficient new investments; and so on.

Our results unveil the significance of the daily price limits on the daily returns of stocks, especially early listed ones, for instance the coefficient is +0.064499 with SAM's mean equation, while at the negative level, -0.202526, in REE's. Thus, the impact of the price band is not coherent with different stocks, even closely linked stocks as REE and SAM. Market events, specifically stock splits (REE and SAM) show little effect on the individual risk levels, but quite significant in return levels of most stocks, including the market index returns and their own equity performance. Both splits of REE and SAM stocks add to the gain of other 8 stocks, but not the VNI returns (-0.016637 and -0.002693, respectively). All ARCH and GARCH terms in our considered variance equations are significant, generally at any level. In one case (Tribeco), ARCH term is significant at 5 percent, and insignificant in the case of CAN.

The above shows us empirical results on GARCH specifications with exogenous variables for 11 time series at hand. The dynamics show substantial changes from the previous pure ARMA-GARCH with no predetermined variables (univariate, with lagged dependent variables).

Volatility and role of information: We now have an opportunity to look into the role of information in the changing process of volatility. The information flows in our definition comprise of a range of news releases and updates spread among investors. A number of changes in security trading rules are also included in the news available in the marketplace. Given the estimation results, apparently some news has more influences than others. Specifically, general market bad news helps explain the increase of volatility in several stock returns, for instance, the case of Danaplast, or DPC. We also see that general market bad news variable is significantly negative, such as the case of Canfoco (CAN), with a small magnitude, specifically 4.23×10^{-5}. In effect, we realize that a particular piece of information may have quite different impacts on securities. A generally perceived market bad news may not be always bad to all stocks listed on the market.

Now let us look at a particular case of information on Bibica (BBC), whose bad news used to make the market move apparently in early 2003. Expectedly, the variable BBCDB is significant in most variance equations of other stock return dynamics. In many cases, where the coefficients are empirically significant, for instance in HAP, REE and SAM returns modeling, the sign of the coefficients are minus $(-)$. These significantly negative coefficients can be interpreted to have reduced the volatility of these stock returns amid the general negative impact of BBC accounting

scandal on the marketplace in general, and on the investing mood in BBC itself, in particular.

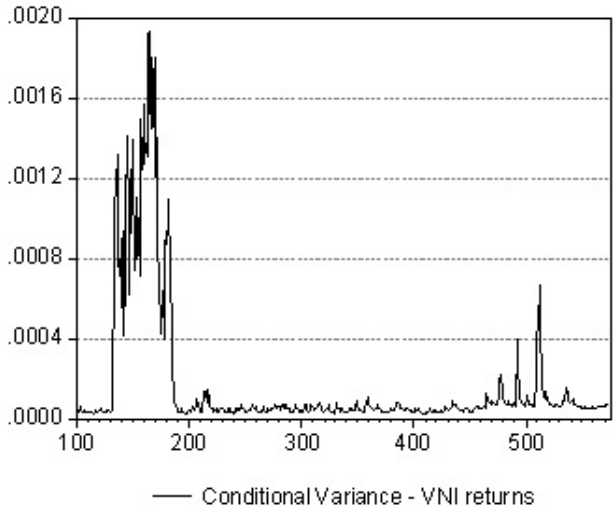


Figure 11: Market return's conditional variances; dummy analysis

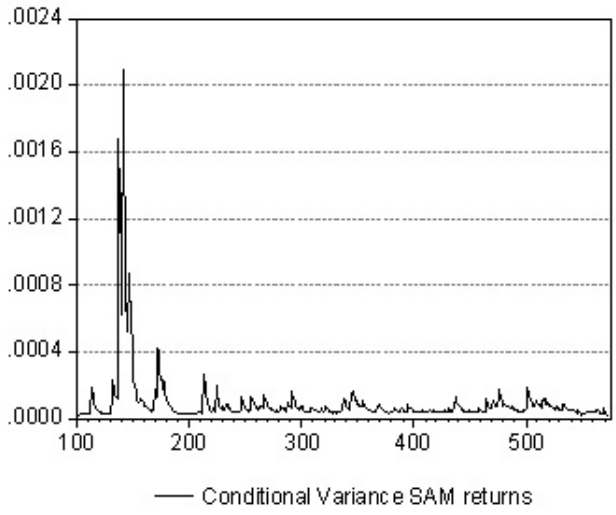


Figure 12: SAM return's conditional variances; dummy analysis

These represent 3 distinct patterns. As to VNI, we know that it represents a general trend of the market, by taking an average effect on a variety of changes in the marketplace. For SAM, the dynamics represents a veteran stock; one stable market performer. And BBC is viewed as one

source of risks in the market, and belongs to the second group of listed firms. There have been two distinct periods of picking variances. The first peak represents period with many changes in trading rules, introductions of limits, and administrative measures to deliberately 'cool down' the investing fever by the authorities, SSC/HSTC. This effort shows immediate effect, with which risk level jumps apparently, and returns turn negative. The conditional variance for this period is quite persistent at higher level before reducing following the impact of narrowing down the daily price change limits. The second peak is much weaker in magnitude and less persistent. The transient leap in volatility should be perceived as taking into account one-off effect of news from individual company, while no apparent overall changes in market rules, or intervention take place.

Looking at the behavior of SAM's, the conditional variance graph also represents a peak in the same period of the first peak in VNI variance series. However, there is no sign that the recent CAN and DPC scandals put any pressure on the evolution of volatility of this stock at all. Besides quite normal shock updates, the conditional variance dynamics of SAM returns appears to be quite stable. This can be a support for the general market perception that SAM is a trustworthy stock available. In fact, the intuition persuades investors that its shares are liquid and actively traded. We also see that even when the mean equation of the modeling indicates negative impact of its stock split on the daily returns, the split itself carries no explaining power in the variance equation, thus cannot be a source of risk. Therefore, the stock split in the case of SAM is simply a technical change, which affect the investing mentality briefly, before returning to some stable level as observed in the graph.

However, as we see below, the evolution of risk in the case of BBC is quite different. The dynamics shows a much more volatile process of risk for BBC returns. We cannot recognize the peaks for GARCH variance series of BBC because its evolution changes constantly and wildly. The first jump corresponds to the first peak of both VNI and SAM returns series as discussed above. However, this jump in risk level is by no means the most volatile period. We can easily observe that risk tends to rebound after short period, and keeps moving to new heights as shown in the figure (13).

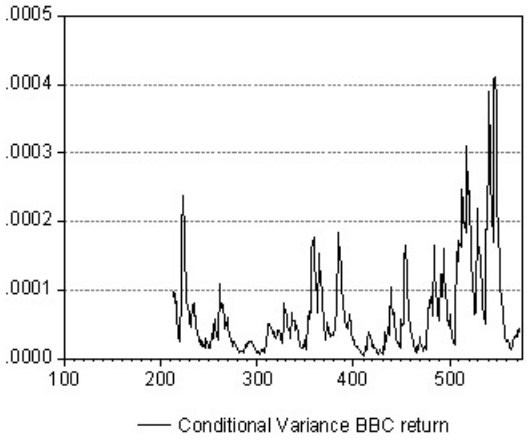


Figure 13: Bibica conditional variances; dummy analysis

The magnitude of conditional variance for daily returns recently exceeds 0.0004 (or 0.04 percent

on a daily basis). Besides the pure volatility concern, returning to the mean equation, we find it interesting that BBC returns have been positively influenced by the splits of both REE and SAM stocks. Its return also co-moves with highly positively significant coefficient towards the market returns. While market general positive information flows positively (and significantly) improves the daily returns of BBC, its own positive information shows no significance in the modeling.

4 Closing Remarks

We try to have some useful explanation from the above empirics.

4.1 Market situation, variables and properties

We have examined a number of important aspects of related stock variables, especially returns. Except the price in levels, all other series exhibit empirical stationarity, and are valid for regressional analyses in our study. With a particular interest in return time series, we have found that the autoregressive feedback mechanism of low order (up to 2) has proved to be sufficient to capture the major dynamics of the returns, and squared returns.

Returns of stocks listed on HSTC show a strong co-moving trend. The evidence of serial correlation in residuals and squared residuals is found, prompting us to further model ϵ_t to remove the correlation impacts on further inferences. Then the (G)ARCH relevance comes into our considerations, where the possibility of both volatility clustering and thick tails in return distributions is apparent.

Notably, we establish evidence of the anomalies of HSTC stock returns through emphthick clusters of limit-hits in early stages of operation. The situation lessens later on, in the stabilized period, but surged again with cluster of limit-hits, to either side of limits. By simple statistic, it is striking that some sequence of consecutive hits to either limit can reach 127 days, non-stop. The number of sequences with more than 10 consecutive hits is not small at all. This leads to the situation of constant disequilibrium for a substantial period of time. In relation to this problem, we find empirical evidence for the well known *herd behavior* among investors, by which people suppress own private information and expectations to follow the market's collective action. And the trend of herd behavior is stronger toward extreme positive returns of the market, and in fact, around the consecutive sequence of limit-hits.

4.2 Policy implications found in this study

In fact, the above anomalies have the root in policy changes and specific implementations, such as widening or narrowing the daily price variation band, limiting buy orders, installing or removing a particular trading device (removing the Cancellation in the past, and adding ATO very recently), and so on. These implementations, except the price variation limit, are all shown in dummy variables, which receive the value of 1 when occuring, and 0 otherwise.

Nonetheless, the impacts of these variables found in our research are not necessarily coherent among stocks. With regard to the general influences, VNI return tends to be a largely influential variable that is significant in most modeled dynamics of individual stock returns. In brief, we have reviewed the effect of most variables in the marketplace.

The results from using policy variables are meaningful. The market view authorities' moves in policy making process as a mixture of negative and positive impacts, depending on the nature of decisions themselves. For example, price variation limit is highly significant in all cases, but surely has different degrees of influence in different periods of market history. The jump of risk level, through the conditional volatility of both stocks and index returns, is greatly attributed to the manipulating of price limit.

The significance of the policy variables, in different instances, implies the fact that the decision making process in general has generated potential changes in investing behaviors, reflected by changing levels of returns and risks for both individual stocks and the weighted market index. As we have modeled their significance in specific cases for stocks and index, the following shows formal representations of the dynamics derived from the empirical consideration above.

4.3 Volatility dynamics

A formal representation of the analyzed volatility dynamics is provided in table (11).[4]

Table 11: Formal representations for GARCH with policy implications

Series			Mean and Variance Equations
VNI	$r_{VNI,t}$	=	$0.11823 + 0.1287 \cdot r_{VNI,t-1} - 0.116 \cdot Band_{t-1} + 8.65 \cdot 10^{-4} RRMktV - 4.28 \cdot 10^{-8} MktImb + 8.485 \cdot 10^{-3} MktDG - 0.01664 \cdot REESpl$
	σ_t^2	=	$0.5439 \cdot \sigma_{t-1}^2 + 0.2647 \cdot \epsilon_{t-1}^2 - 5.51 \cdot 10^{-5} \cdot BBCDB$
REE	$r_{REE,t}$	=	$0.2077 + 0.0935 \cdot r_{REE,t-1} - 0.2025 \cdot Band_{t-1} - 9.98 \cdot 10^{-8} REEIMB + 0.0093 \cdot MktDG + 0.00786 \cdot REESpl$
	σ_t^2	=	$0.5747 \cdot \sigma_{t-1}^2 + 0.2444 \cdot \epsilon_{t-1}^2 - 6.58 \cdot 10^{-5} BBCDB$
SAM	$r_{SAM,t}$	=	$-0.0658 + 0.0645 \cdot Band_{t-1} + 1.0742 \cdot r_{VNI,t} - 0.00609 \cdot MktDG - 0.002123 \cdot SAMSpl$
	σ_t^2	=	$0.6695 \cdot \sigma_{t-1}^2 + 0.2389 \cdot \epsilon_{t-1}^2 - 1.3 \cdot 10^{-5} BBCDB$
HAP	$r_{HAP,t}$	=	$1.0614 \cdot r_{VNI,t}$
	σ_t^2	=	$0.5965 \cdot \sigma_{t-1}^2 + 0.1453 \cdot \epsilon_{t-1}^2 - 2.7 \cdot 10^{-5} BBCDB - 1.43 \cdot 10^{-5} MktDB - 6.94 \cdot 10^{-5} SAMSpl$

Likewise, constructions for the rest of the estimations in this study can be done straightforward. What we have observed with respect to the policy implications show that the market has in general been sensitive to some type of decisions made by the authorities, SSC and HSTC. The ultimate impacts of the decisions made by these agencies are always unpredictable. For instance, 'good news' (of course, in the view of the general market) only shows positive impact on daily returns of the index itself in the above summary table, while significantly negative to returns of SAM stock. In another instance, general market bad news, recently caused by new-listed stocks, renders the conditional variance portion of veterans significantly lower, by the minus signs found in the variance equations of the fittings.

We would like to close this discussion by saying stating that the policy on price limits appears to have been destabilize the market by creating runs of hits. The market has constantly been in disequilibria due to anomalies of price formation process where disequilibrium price is accepted and used as reference for the next trading session. In fact, the price limit should be used as a

[4]Note: In the above substitutions, insignificant coefficients are not present because the empirics shows that they are not empirically significantly different from zero. Only estimated parameters that are significant at conventional levels are displayed.

circuit-breaker and widened, so that the market will be able to self-adjust. This change of policy is necessary and to our best knowledge of use to the performance of VSM.

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