

# Short Selling and Stock Market Returns

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- Short selling (SS) is a longstanding form of trading, popular for over a century.
- Renewed attention, recently, due to increase of SS volume
- Reasons behind short selling of stocks (Dechow, 2001, Christophe et al. 2004)
- Concern expressed, SS may lead to lower stock prices, in a declining market reinforce downward trend. Regulators apprehensive, explains why they have constrained SS i.t.o. information, quantitative limits, costs

- However SS constraints are of concern to academics, practitioners and regulators: if only optimistic traders set price, stocks overvalued.
- In efficient market theory, SS constraints cause overpricing. If SS unconstrained, overpricing would not appear (Rubinstein, 2004), SS would not predict negative excess returns, and should show less and less predictive power. As constraints are relaxed, overpricing vanishes.
- The issue is in less efficient markets, SS might be construed as negative signals, even if unconstrained.

- Disclosure on SS and stock lending (SL) is a tool for risk reduction, avoid SS for manipulative purposes, market abuse, disorderly markets (IOSCO, 2003).
- Authorities/regulators should provide transparency, regular disclosure to public on SS activity. So its effect, anticipated, change in market conditions can be understood, useful input for market participants.
- Evidence accumulating on relationship between constrained SS and negative excess returns, supporting the view that SS is bad news.
- For Miller (1997) severe SS constraints lead to overvalued stocks since mainly optimistic investors set prices. Negative information does not find its way to stock prices, since SS comes at high cost.
- For Diamond-Verrechia (1987), costly constrained SS is used only by investors who expect high benefit.

- For Figlewski-Webb (1993) SS (lack of information, reduced size of SS) reduces information efficiency of pricing mechanisms, impeding stock price adjustment and speed ( Ackert-Athanassakos, 2005).
- For Rubinstein (2004), in unconstrained SS heterogeneous beliefs and optimistic investors (buy long) counterbalance pessimistic investors (sell short) to jointly set equilibrium prices. With unconstrained SS, positive bias on prices and subsequent returns will be low.
- Bris, Goetzmann and Zhu (2004) argue that unrestricted SS is desirable as it facilitates efficient asset pricing. Sufficient evidence of negative effect (Figlewski, 1981, Desai et al. 2002, Asquith et al.2005, Aitken, 1998, Angel et al. 2003, Dechow 2001, Ackert – Athanassakos2005,). Markets investigated, US, Canada, Australia, mainly Taiwan.

- Alternative trading strategies using stock with traded options increase market efficiency, reduce the effect of constrained SS and therefore the connection between high SS and subsequent negative excess returns.
- Exception, Woolridge and Dickinson (1994) with US data find positive relation. Also maintain SS for other uses (liquidity, arbitrage, hedging, tax related activities)
- Goal of the study: To help clarify impact of SS on pricing in Athens Exchange (ATHEX).
- Interesting case due to:
  - a) small, developing market.
  - b) Liberal information disclosure during the sample period. High transparency, rarely shown in other markets. Daily information dissemination on SS, SL (transactions, prices)
  - c) At the same time constrained SS implemented, exception last year of examined period.

- While constrained SS implemented in almost all markets, high transparency level, rarely shown in other markets, has positive effect and could mitigate effects of constrained SS.
- SS introduced in ATHEX in 2000 due to newly created derivatives market and the markets becoming more mature (May 2001).
- Viewed with fear due to down market prevailing, may precipitate collapse of stock prices.

- Constraints, high execution costs, burdensome SS procedures, limited lendable stock, required prior stock borrowing, prior return of borrowed stocks, payment of interest for borrowing stock, deposits of high margin, borrowing of stocks only from regulated pool of ATHEX. SS very strict, stricter than other markets. Only in last years (2007 and 2008) significant changes took place due to MiFID.
- The effect of SS is examined for January 2003 – December 2007 period, the only available period of full information and data availability.

- Evidence suggests that SS and excess stock returns are progressively negatively correlated. High SS is related to negative abnormal returns.
- Greek market lacked exchange traded stock options to enable investors act with lower transaction costs, moderating the negative relationship.
- Period analyzed offers unique opportunity for Greek markets. From early 2008 along with SS, SL liberalization, the daily information dissemination was halted. Information vacuum for the market arose. Neither ATHEX nor HCMC released even periodical information. Furthermore, due to world crisis, SS was sustained from October 2008 to May 2009. (It started again in June 2009 with disclosure provision; its future (SS, information) is unknown.)

- The developments render the paper more valuable on SS liberalization and transparency start moving to opposite directions due to the longest continuous period, so far, examined.
- Stock lending and borrowing mechanisms in ATHEX refer to repurchase agreements on listed stocks in the form of Standardized Products, stock repos (SR) and stock reverse repos (SRR). Formulated as derivatives products (tax provision, although lending product agreements).
- ATHEX (its clearing house, ADEXDCH) acts as the central counterparty.

- A pool per underlying stock is created in ATHEXDCH allowing investors to acquire (borrow) stocks to meet delivery obligations due to SS on exercise/expiration of derivative products.
- The trading date, number of contracts sold, trade price are recorded in every repo transaction. An agreement fee for repo product paid by buyer (borrower) to seller (lender), calculated on a daily basis for the use of underlying stocks.
- SRR investors pay daily interest to ATHEXDCH and provide a daily margin for the transfer of shares. 6 months duration. Transparency here as well.
- Open position of ATHEXDCH per underlying stock not higher than 5% of total outstanding shares.
- A bilateral lending facility (BRA) under freely negotiated interest rates was introduced in April 2002, restricted to ATHEX members, recorded daily.

**Table 1** Average daily stock borrowing to free float outstanding shares in ATHEX (%)

Company	2003	2004	2005	2006	2007
Public Power Co	0.092	0.050	0.300	1.480	1.964
Eurobank	0.200	0.114	0.319	0.727	0.948
ELPE	0.050	0.007	0.050	0.377	0.875
TITAN	0.055	0.050	0.186	0.439	0.738
MOTOR OIL HEL.	0.007	0.000	0.027	0.080	0.540
Hel. Telecom	0.127	0.085	0.003	0.235	0.506
ALPHA	0.343	0.141	0.150	0.406	0.491
Agricultural Bank	0.000	0.005	0.001	0.215	0.486
NATIONAL BANK	0.088	0.099	0.264	0.195	0.447
OPAP	0.019	0.025	0.144	0.255	0.358
FOLLIE	0.019	0.005	0.122	0.464	0.367
INTRACOM	0.055	0.009	0.010	0.355	0.356
HELEX	0.043	0.003	0.066	0.067	0.218
COCA COLA 3E	0.060	0.120	0.317	0.420	0.200
ELTEX	0.058	0.007	0.034	0.235	0.198
Hel. Duty Free	0.010	0.009	0.020	0.089	0.611
Commercial Bank	0.313	0.504	1.660	1.261	0.261
TECH. OLYMPIC	0.006	0.001	0.007	0.019	0.058
MYTILINEOS	0.028	0.005	0.004	0.017	0.048
DELTA	0.002	0.000	0.006	0.201	0.032
MAILIS	0.006	0.000	0.000	0.000	0.060
IASO	0.003	0.006	0.003	0.000	0.023
SIDENOR	0.006	0.000	0.000	0.000	0.024
ALTEC	0.022	0.017	0.003	0.007	0.000
S&B	0.000	0.000	0.000	0.000	0.012
BIOCHALCO	0.072	0.010	0.028	0.082	0.068
DOL	0.032	0.030	0.010	0.003	0.010
EGNATIA	0.006	0.000	0.002	0.007	0.000
ELBAL	0.016	0.000	0.000	0.010	0.016
AEGEK	0.012	0.007	0.004	0.014	0.000
EVDAP	0.007	0.007	0.000	0.000	0.035
FOURLIS	0.000	0.003	0.003	0.006	0.020
HRAKLIS	0.002	0.000	0.001	0.002	0.005
Hel. Sugar Co.	0.010	0.020	0.000	0.000	0.000
KLONATEX	0.002	0.007	0.009	0.000	-
LYKOS	0.000	0.006	0.002	0.000	0.000
METKA	0.008	0.000	0.000	0.034	0.022
MINOAN	0.008	0.003	0.000	0.000	0.013
NAOUSSA	0.008	0.007	0.000	-	-
SANYO	0.021	0.002	0.005	0.000	0.000
TELETIPOS	0.013	0.000	0.000	0.000	0.004
TERNA	0.000	0.000	0.000	0.000	0.020
General Bank	0.000	0.000	0.008	0.000	0.003
VOVOS	0.004	0.000	0.005	0.000	0.000
XALKOR	0.004	0.000	0.000	0.008	0.004
MARFIN INV. GROUP	-	-	-	-	0.394
BANK OF CYPRUS	-	-	-	0.200	0.166
BARYLAND	-	0.000	0.000	0.000	0.034

Source: ATHEX and computed data

- Table 1 presents daily borrowing volumes. A rising trend, these stocks count for highest part of ATHEX capitalization.
- Short selling, until early 2007, involved an on-exchange sale of securities that the seller does not own.
- Pre-lending rule, otherwise prohibited.
- Up-tick rule, flat-tick rule (since June 2005)
- Return of borrowed stock at the day of acquisition.
- SS transactions marked in the electronic trading system (dissemination) as well as “buy to close order”.

**Table 2** Average daily short transactions to total average daily transactions in the ATHEX market

Company Name	Sector	2003	2004	2005	2006	2007	2003-2007
Alpha Bank	Banks	4.5	1.7	2.0	4.2	3.5	3.2
Coca-Cola Hellenic Bottling	Food & Beverages	1.9	1.7	2.1	3.9	3.1	2.5
<u>Cosmote</u>	Telecoms	1.1	0.8	0.6	3.1	2.3	1.6
Titan Cement	Building Materials	2.5	0.8	2.1	4.4	6.3	3.2
<u>Viohalco</u>	Holding Companies	5.0	3.6	4.1	3.5	5.2	4.3
Public Power Corporation	Utilities	0.8	0.4	0.9	2.1	3.3	1.5
National Bank of Greece	Banks	2.3	0.9	3.4	2.0	6.6	3.1
Hellenic Petroleum	Oil Refinery	2.7	1.0	1.3	3.3	6.4	2.9
<u>Emporiki Bank</u>	Banks	1.5	2.5	4.2	2.8	1.9	2.6
OPAP	Lottery	0.2	0.5	1.2	1.8	2.9	1.3
Hellenic Telecom Organisation	Telecoms	0.9	0.6	1.0	1.7	3.6	1.5
EFG Eurobank Ergasias	Banks	1.7	0.4	1.9	3.5	4.4	2.4
Piraeus Bank	Banks	2.6	0.9	2.4	4.7	5.9	3.3
<u>Folli Follie</u>	<u>Jewellery</u>	0.0	0.0	0.8	2.0	1.8	0.9
<u>Marfin</u> Investment Group	Investment Fund	0.0	0.0	0.0	0.0	1.2	0.2

Source: ATHEX and computed data

- Regulatory caution justifies these arrangements, doubts an adequacy of efficiency of market. (C. Alexakis and Niarchos, 1998, 2003). Also, need to safeguard lenders. Simultaneously, a very transparent regime.
- SS ATHEX arrangements faced criticism due to problems, inherent weaknesses (feed share price manipulation, short squeeze, insufficient hedge due to up-tick rule, discounts in futures contracts, inability to develop stock options, restricted use of bilateral agreement, borrowing costs, high margins, no over the counter bilateral agreements, prohibition to lend on settlement day but on trading day, among others).

- However, informative content of SL and SS activities predominated in Greece, detailed daily information, not existing elsewhere (when it exists it is usually weekly, fortnightly, monthly).
- The reform in early 2007 wiped out the above.
- The major liberalization in April 2008 on lending activities could also take fully through OTC market, without being cleared through ATHEXDCH. Crucial for the elimination of the supply constraints on SL, SS. SS became more efficient and attractive.
- However, simultaneously OTC lending positions stopped being announced, SS and buy to close trades stopped being marked, not replaced by periodic information.
- Information vacuum from April 2008 to October 2008. Then, SS sustained until out May 2009.

# Quantitative Analysis

- Period examined: 2003 – 2007
- 13 (out of the 15) shares traded throughout period, SS undertaken for each month of period, amounting to 65%-75% of market capitalization, even higher daily transaction value.
- Results conditional on large firm size, high liquidity stocks, being the only ones to be sold short.
- Daily stock prices, SL, SS data collected from ATHEX daily electronic information and processed.

- Investigate whether SS associated with positive or negative stock returns.
- Use event study methodology (Brown and Warner, 1985) to test for the 30-day post-event period abnormal returns, based on the assumption of capital market efficiency (Fama). Standard method used to examine post event share price performance: compare post announcement returns with predicted normal returns within the event window to derive abnormal returns based on the market model. Test the hypothesis that a sample's event period cumulative abnormal return is zero.

- Market model assumes linear relationship between the security return and the return of the market portfolio:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + e_{i,t}$$

- $E(e_{i,t}) = 0$  and,  $\text{Var}(e_{i,t}) = \sigma_{et}^2$  where  $t$  is the time index,  $i = 1, 2, \dots, n$  stands for security,  $R_{i,t}$  and  $R_{m,t}$  are the returns on security  $i$  and the market portfolio, respectively, during period  $t$ , and  $e_{i,t}$  is the error term for security  $i$ . The prediction error (difference between actual return and predicted normal return), or abnormal return, is

$$AR'_{i,t} = R_{i,t} - \hat{\alpha}_i - \hat{\beta}_i \bar{R}_{m,t}$$

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- $R_m$  is the mean of the market portfolio. Abnormal returns are calculated by taking the following calendar month.  $\hat{\beta}_i$  is the beta estimate during the last two years using weekly prices. Under the null hypothesis, the excess returns will be jointly normally determined with a zero conditional mean and conditional variance which reduces to

$$\sigma^2(AR'_{i,t}) = \sigma_{e_t}^2$$

- For a subset of N events, the average excess returns at t within the event window are

$$\overline{AR}'_t = \frac{1}{N} \sum_{i=1}^N AR'_{i,t}$$

- Cumulative abnormal returns are

$$\overline{CAR}'(I_1, I_2) = \frac{1}{N} \sum_{i=1}^N \sum_{t=T_1}^{T_2} AR'_{i,t}$$

- The variance of cumulative excess returns is

$$Var \left( \overline{CAR}'(I_1, I_2) \right) = \frac{1}{N^2} \sum_{i=1}^N \sigma_i^2(T_1, T_2)$$

- Daily short transactions divided to daily spot transactions (short interest, SI).
- Include size/risk (company value  $\text{LOG}(\text{MV})$ ).
- Include a regulatory dummy,  $\text{REG}=0$ , 2003 – 2006 and  $\text{REG}=1$  for 2007 (years of regulatory changes in rules).
- Estimate SI, return and size for each day per share and form a pool of data (3.494 obs per year, 17.470 obs for 5 year period).
- Beyond 30-day abnormal return, conduct analysis of 30 day unadjusted returns to see whether SI is also associated with market returns in absolute values.

- Measures of valuation are undertaken based on quartiles, deciles (Figlewski 1981, Figlewski-Webb, 1993) to rank stocks according to their SS exposure and differentiate-enrich results. There is evidence of stocks dominating observations each year being responsible for year to year differences. Based on division of set of observations, in order of size, into equal (4,10) intervals starting the observation value at end of given interval. Membership to a group is not permanent from one year to the other and the inclusion to a q, d, depends on stocks SI in relation to that of other stocks.

$$k=q(n+1)/4, k=d(n+1)/10$$

# Results

- Market Model
- The findings illustrate whether there is any negative association between SI and cumulative abnormal returns. They differ from year to year. They gradually come to show an association between SI and 30-day post-event cumulative abnormal returns (Table 3).

# Results for the year 2003 - 2007

**Table 3** Annual short interest and abnormal returns, regression statistics (1/2003-12/2007)

	Intercept	t Stat	SI	t Stat	LOG(MV)	t Stat	R <sup>2</sup>	F
1/2003-12/2003	-0.0060	-1.1400	-0.0013	-0.1841			0.0%	0.0
1/2004-12/2004	-0.0069*	-2.1165	0.0023	0.3493			0.1%	0.1
1/2005-12/2005	-0.0099*	-1.7775	-0.0108	-0.0995			0.0%	0.0
1/2003-12/2003	-0.3064*	-1.868	0.0046	0.6066	0.0318	1.8327	2.2%	1.7
1/2004-12/2004	-0.3805*	-3.583	0.0093	1.3979	0.0390***	3.5194	7.6%	6.3
1/2005-12/2005	-0.4762***	-3.116	0.0052	0.6328	0.0480***	3.0533	5.7%	4.7
1/2006-12/2006	-0.0044	-0.534	-0.0171*	-1.821			2.1%	3.3
1/2007-12/2007	-0.0077	0.7888	-0.0269***	-3.114			5.9%	9.7
1/2006-12/2006	-0.5861***	-3.092	-0.0122	-1.317	0.0593***	3.071	7.8%	6.5
1/2007-12/2007	-0.6567***	-3.474	-0.0256***	-3.066	0.0575***	3.5198	13.0%	11.4

Note: \*, \*\*, \*\*\* indicate statistically significant results at 10%, 5% and 1% level, respectively.

**Table 4** Short interest, abnormal returns and market size, ranked in deciles and quartiles (1/2003-12/2007)

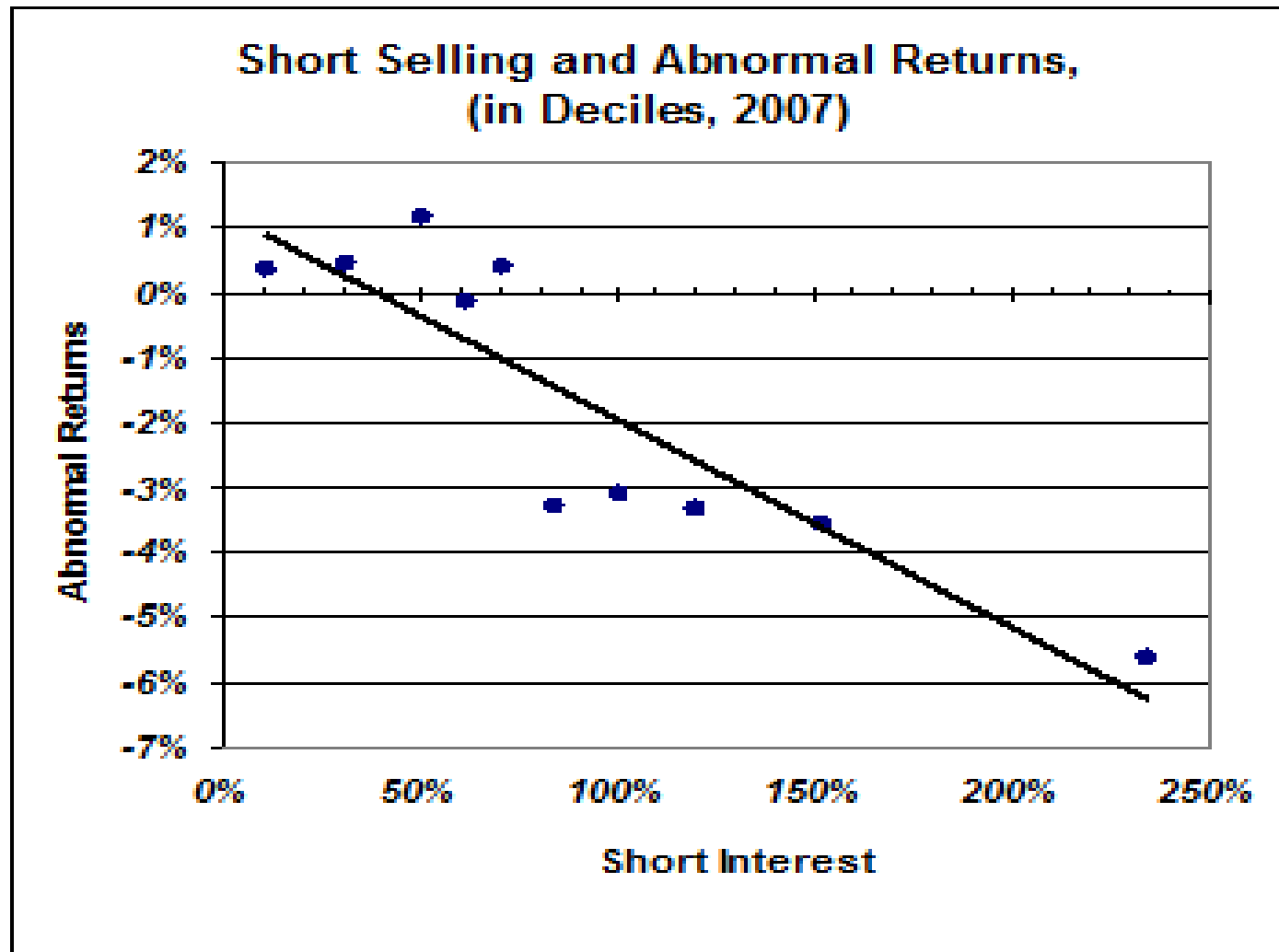
2003				2004				2005			
	SI	AR	LOG(MV)		SI	AR	LOG(MV)		SI	AR	LOG(MV)
D1	189%	-0.72%	9.13	D1	119%	-0.96%	9.34	D1	155%	-0.94%	9.53
D2	104%	-1.74%	9.17	D2	50%	-0.54%	9.48	D2	91%	-0.44%	9.54
D3	63%	1.38%	9.36	D3	33%	-0.33%	9.48	D3	61%	-1.85%	9.61
D4	46%	-3.41%	9.38	D4	22%	-0.49%	9.67	D4	48%	1.09%	9.66
D5	29%	-0.15%	9.46	D5	16%	-2.52%	9.50	D5	37%	-3.26%	9.68
D6	16%	-0.59%	9.46	D6	12%	-0.33%	9.59	D6	27%	-2.63%	9.71
D7	10%	-0.78%	9.42	D7	8%	0.02%	9.55	D7	19%	0.00%	9.74
D8	5%	-0.39%	9.43	D8	4%	-1.06%	9.58	D8	11%	-1.52%	9.65
D9	1%	-0.12%	9.53	D9	1%	0.05%	9.59	D9	4%	-0.08%	9.66
D10	0%	-0.05%	9.37	D10	0%	-0.05%	9.48	D10	1%	-0.56%	9.69
	SI	AR	LOG(MV)		SI	AR	LOG(MV)		SI	AR	LOG(MV)
Q1	133%	-0.56%	9.18	Q1	76%	-0.51%	9.43	Q1	113%	-0.73%	9.57
Q2	42%	-1.27%	9.40	Q2	22%	-1.44%	9.56	Q2	46%	-1.19%	9.64
Q3	12%	-0.80%	9.44	Q3	9%	0.03%	9.56	Q3	21%	-1.33%	9.72
Q4	1%	0.03%	9.45	Q4	1%	-0.60%	9.55	Q4	4%	-0.85%	9.65
2006				2007							
	SI	ab ret	LOG(MV)		SI	ab ret	LOG(MV)				
D1	186%	-6.11%	9.64	D1	234%	-5.63%	9.63				
D2	116%	0.06%	9.76	D2	152%	-3.54%	10.04				
D3	95%	-0.85%	9.76	D3	120%	-3.34%	9.79				
D4	75%	-2.58%	9.72	D4	100%	-3.11%	9.81				
D5	65%	-0.03%	9.68	D5	84%	-3.30%	9.82				
D6	55%	-3.16%	9.74	D6	71%	0.37%	9.82				
D7	41%	-2.11%	9.73	D7	62%	-0.16%	9.84				
D8	29%	-0.04%	9.79	D8	51%	1.16%	9.83				
D9	20%	-0.72%	9.80	D9	31%	0.44%	9.83				
D10	7%	-0.69%	9.89	D10	11%	0.34%	9.75				
	SI	ab ret	LOG(MV)		SI	ab ret	LOG(MV)				
Q1	143%	-3.02%	9.73	Q1	181%	-4.55%	9.82				
Q2	75%	-0.90%	9.70	Q2	98%	-3.07%	9.82				
Q3	45%	-2.05%	9.74	Q3	65%	-0.05%	9.82				
Q4	16%	-0.55%	9.84	Q4	26%	0.88%	9.81				

- For the first three years, if there is such association it seems to be weak for the years 2003 and 2005 and is statistically insignificant.
- Inclusion of market value as an explanatory factor increases model fit, however SI is still statistically insignificant. Size seems to be a more important explanatory factor.
- When ranking the examined shares according to their exposure to short selling and splitting in terms of deciles and quartiles (Table 4), there is some indication of more negative cumulative abnormal returns for the more heavily shorted shares --although this association is not linear.

- The situation seems to change in 2006 and 2007, two years of noticeable rise in short selling. Table 3 shows that short interest alone is a significant explanatory factor of abnormal returns for both years. The fit increases significantly in 2007. The short interest coefficient is negative and statistically significant at the 10% level for 2006 and at 1% for 2007. The inclusion of market value increases the explanatory power of the model, and size is also an important determinant of abnormal stock returns for the Greek capital market. Short interest remains a statistically significant factor at the 1% level in 2007 with negative sign.

- When examining short interest in terms of deciles and quartiles (Table 4) there is a stronger indication of negative abnormal returns for shorted shares in the 2006-2007 period.
- Heavily shorted shares earn significant and higher negative abnormal returns. An indication of negative abnormal returns for shorted shares and a detectable linear association of abnormal returns and short interest for 2007 are illustrated in Figure 1. Equities with low short interest exhibit almost no abnormal returns, whereas abnormal returns can reach up to -7% for highly shorted stocks. We conclude that short selling is linked to negative abnormal returns primarily for the heavily sold short stocks in the ATHEX market.

**Figure 1** Short selling and abnormal returns, in deciles, 2007



# Results for the 2003 – 2007 period

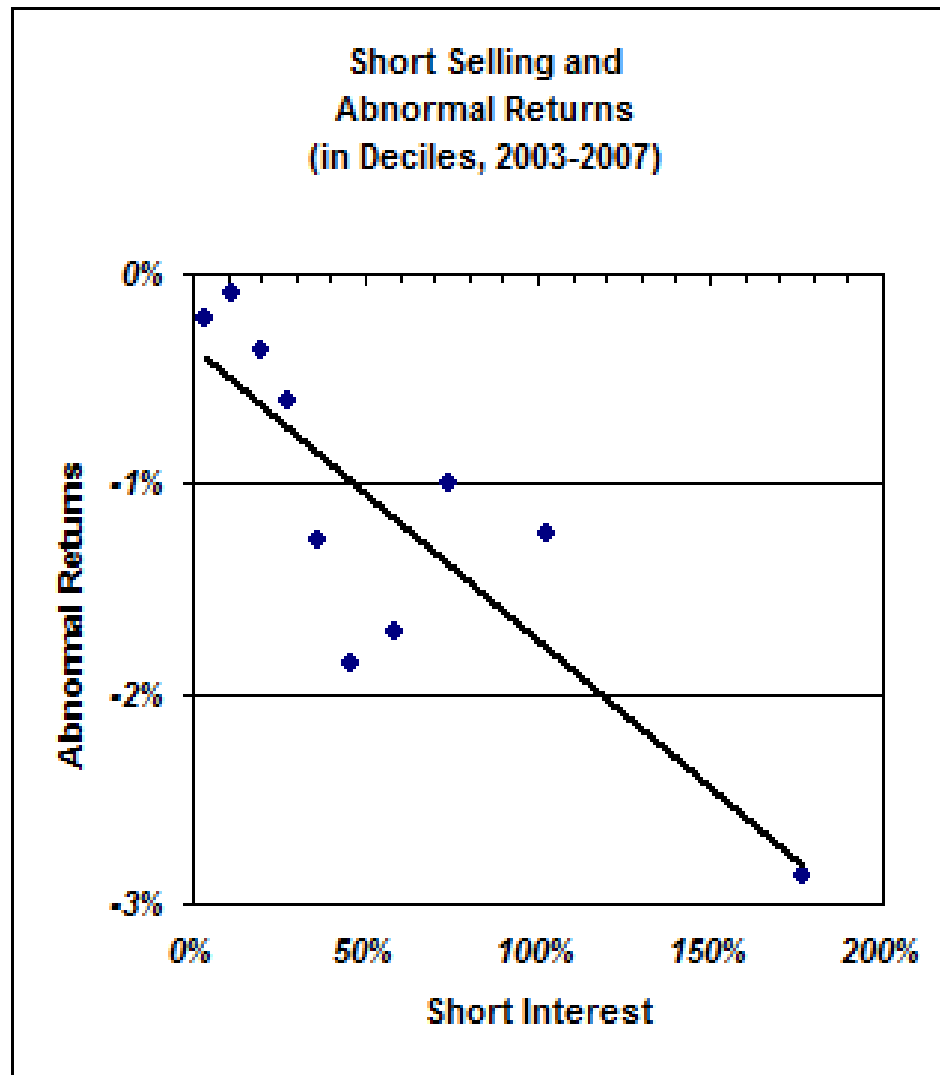
**Table 5** Short interest and abnormal returns, regression statistics (1/2003-12/2007)



	Intercept	t Stat	SI	t Stat	LOG(MV)	t Stat	REG	t Stat	R <sup>2</sup>	F
1/2003-12/2007	-0.0045*	-1.658	-0.0121***	-3.605					1.6%	13.0
1/2003-12/2007	-0.0044*	-15.703	0.0119***	-3.3028			-0.0021	0.0051	1.5%	6.5
1/2003-12/2007	-0.2707***	-4.411	-0.0117***	-3.537	0.0276***	4.3418			4.0%	16.1
1/2003-12/2007	-0.3148***	-4.8437	0.0101**	-2.6665	0.0323***	4.7809	-0.0110*	-2.0255	5.1%	12.1%

Note: \*, \*\*, \*\*\* indicate statistically significant results at 10%, 5% and 1% level, respectively.

**Figure 2** Short selling and abnormal returns, in deciles, 2003-2007



- When examining the five-year period 2003–2007 in whole (Table 5) an overall negative association between short interest and abnormal returns is found --implying that the price of the stock being sold short depreciates by more than its peers not being sold short.
- The regulation dummy variable seems to be insignificant (not effecting the regression fit)

- When the REG dummy is included, it is significant at 10% level with a negative sign, suggesting (perhaps surprisingly) that the change in regulations reducing short sale constraints exerted a negative influence on the market.
- When analyzing the data in terms of deciles and quartiles, the abnormal returns seem to be moderated when the whole period is examined. A linear association of negative abnormal returns and short interest seems to be depicted in Figure 2.
- When ranking by deciles (Table 6) heavily shorted shares (D1) are associated with -2.87% abnormal returns, whilst lightly shares (D10) are associated with -0.20% abnormal returns.

- Size does not seem correlated with the SI factor. The results here seem to reinforce those from annual estimations, pointing to negative abnormal returns for highly sold short stocks.
- Even when regressing unadjusted market returns to SI, a negative (albeit weaker) relation is also found (Table 7). (Here the REG dummy depicts a negative sign and appears significant, increasing the regression fit).
- The findings appear to lead to several implications. First, the relation between short selling and market returns has become more important over time for the Greek capital market. Short selling came to play a progressively more significant role in 2006 and 2007.

**Table 7** Short interest and unadjusted market returns, regression statistics (1/2003-12/2007)

	Intercept	t Stat	SI	t Stat		t Stat	R <sup>2</sup>	F
1/2003-12/2007	0.02392*	5.510	-0.00610	-1.161			0.2%	1.35
	Intercept	t Stat	SI	t Stat	REG	t Stat	R <sup>2</sup>	F
1/2003-12/2007	0.00258*	0.86103	-0.0086 **	-2.22608	-0.00867*	-1.54951	1.1%	5.23

Note: \*, \*\*, \*\*\* indicate statistically significant results at 10%, 5% and 1% level, respectively.

- The relation between short selling and market returns can not be attributed to the relation of short selling with other market factors such as company size. Short selling is uncorrelated to other variables that can explain an important bulk of abnormal stock returns.
- Third, heavily shorted stocks suffer from larger negative abnormal returns, in contrast to moderately shorted stocks which do not seem to be associated with any negative returns.

- Fourth, the results provide an indication that the regulatory changes liberalizing short selling in the beginning of 2007 may not have affected the market in the desired way by reducing negative abnormal returns. Based on the literature, this seems to be a rather unexpected result.
- It may be that in reality short selling remained restrained throughout 2007, given that the supply of lendable stocks was truly liberalized only in April 2008 and that the daily ATHEX liquidity (at the given level of short interest) was not sufficient for heterogeneous investors' beliefs to be counterbalanced in jointly setting equilibrium stock prices.
- The main findings are in line with studies from other markets

- The findings are of interest to regulators and market participants.
- If short sold shares truly underperform the market, then short selling provides a strong indication of share performance in the short run.
- The negative abnormal returns for the sold short stocks are generated here on the basis of the strong information content of these practices, and the constrained short selling structure prevailed.

- This study provides evidence on whether short selling is associated with positive or negative market returns in the Greek market.
- It documented a negative association, along with the rising importance of short selling in daily ATHEXCM transactions.
- The Greek market is differentiated in that the arrangements never limited the information content to investors of stock lending and short selling transactions during the period under review.
- The supply for shortable shares faced important constraints due to cost and/or availability of shares.

- Negative abnormal returns were limited to heavily shorted stocks.
- This might imply a positive role for the practiced market transparency.
- Thus constrained short selling, in the absence of products such as options and convertible bonds, may be associated with negative abnormal returns, despite the high transparency in stock lending and short selling.
- An alternative explanation might be that the diversity of opinion and negative expectations became strong during 2007 while the growth of hedge funds created concerns about speculation. This should not be the case, however, for short selling.

- At first, market participants blamed the hedge funds for market downturns. Since 2005, though, this has been largely reversed as markets recovered and investors realized the underlying causes of the market developments and those of the recent financial crisis.
- With regard to the regulatory framework, the findings support a further easing of the framework for short selling in the market as this would allow stock prices to reflect the information more fully, resulting in a swifter price adjustment and more efficient market pricing. At the same time, the Greek market needs to improve its efficiency by improving its daily liquidity.

- Despite improvements in market liberalization, the important aspect of information dissemination should be maintained, permanently. Otherwise, the possibility of market manipulation and abuse cannot be ruled out, in the sense that only certain market participants will be able to gain from proprietary information, in relation to the high majority of traders and investors. All investors should have equal access to such information.