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Short Selling: *Discussion* of Short Sales Constraints and Momentum in Stock Returns

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SHORT SELLING

1. Introduction

Data on the cost of short selling stocks has been noticeable by its almost entire absence until recently, and the research implications of such ignorance for both developments in asset pricing theory and the empirical implementation of investment strategies is only recently coming to be better understood. Finance theory makes very strong assumptions about the ability of arbitrageurs to borrow and sell short large amounts of stock at no cost, (see Fama (1965, 1970), Ross (1976)). Yet while short selling is central to the theoretical foundations of the Efficient Markets Hypothesis and asset pricing theory, there has been relatively little discussion regarding the mechanics, costs, feasibility and extent of short sales, let alone its market impact. That constraints on short selling, whether formal and legalistic, or informal and cultural, can lead to overpricing of securities is the single most important theme of the literature: these securities may well have low future returns until the overpricing is fully corrected. Further, while direct trading costs such as bid-ask spreads and commission are incurred when buying or selling a position, short sale costs is a holding cost and hence related to the length of time a short position is maintained: this may well be for several months or even years for certain strategies such as momentum or value versus growth, and hence they will be greater than direct transaction costs.

In this discussion we concentrate on short sales of equities[1]: we begin with a discussion of the perceived restrictions on short selling, together with the implications of these restrictions and the information content of changes in short interest. We then turn to the mechanics of short selling, the key facts that have emerged from proprietary data in recent years, and the extent of short selling restrictions in a global context. We then examine how data issues have influenced research before reviewing the empirical evidence on short interest and market returns behaviour, including the link to earnings' announcements. We conclude with a brief discussion of UK experience and how recent research such as Nagel

[1] Of course, there are other well established alternatives to betting on downward movements in stock prices, including options and single stock futures; while we do not pursue them here, we note that some international comparisons of short selling rules do include such derivatives in their coverage (see Charoenrook and Daouk (2005) for put option regulations).

(2006) and Ali-Trombley (2006) are opening up new ways to think about mispricing and associated investment strategies.

2. Background

There can be little doubt that the term 'short sale' would be considered by many to be the most offensive term in the linguistics of finance and financial markets, being met with opprobrium by certain market commentators, regulators and politicians alike, usually as markets swing downwards after unsustainable excesses, whether it is 1987 or 2001, or even with the suggestions that certain informed agents may have short sold insurance and airline stocks prior to the 9/11 events in the US. Chancellor (2001) provides an interesting account of such events since 1600, emphasising that similar events and reactions have occurred throughout history, whether it was the East India Company in 1609, the Mississippi and South Sea bubbles of the early 18th century, the Great Wall Street Crash of 1929, or the events of 2001, short sellers have been blamed for driving prices down, regulators have imposed, or considered restrictions, on short selling, and where governments have acquiesced to this pressure, such rules have had little market impact. Further, he suggests that there is little or no evidence of short sellers being instrumental in forcing prices lower in many of the occasions in which they have attracted blame (i.e. the Asian currency crisis of 1997).

Although textbook accounts of asset pricing rely on unlimited arbitrage (and hence short-selling), another school of thought sees definite limits to these processes (e.g. Schleifer, (2000), Savor and Gamba-Cavazos (2005)). At its simplest, if short selling is costly and hence constrained, the marginal investor will be an optimist when a divergence of opinion exists (Miller (1977), see also Jarrow (1981)). The key recent contribution of D'Avolio (2002), Nagel (2006), Ali-Trombley (2006) and others is to calibrate and explain this cost of short selling in the real market context, often in a relative rather than absolute metric, and apply such findings to re-examine investment "anomalies" that are inconsistent with perfect arbitrage. As they show very clearly, some major sources of predictable returns such as momentum investing, and value versus growth, may appear unprofitable when real world short selling costs are appropriately calibrated and hence this helps us

discriminate between the mispricing and risk explanations for these "anomalies", (e.g. Ali, Hwang, and Trombley (2003)).

The growing popularity of hedge funds has led to more detailed analysis of the role of short selling investment strategies. The use of accounting data, technical analysis and tax strategies by market short sell professionals is described by Taulli (2003), while the benefits of adding a short selling fund to a portfolio of other hedge fund strategies in terms of risk-return improvements is explained in Jaeger (2003). Basically short selling as a strategy is often the only one which has a negative correlation with both other strategies and wider market indices, including equities and bonds, and hence is important in determining the shape of the mean-variance efficient frontier.

In the UK for FTSE 100 companies the average percentage of firms' shares on loan in the market has increased from 3½% in late 2003 to over 5% by late 2005 (Makinson Cowell (2005)); for FTSE 250 companies the average has risen from 2% to 3% over the same period. Detailed figures for the US (e.g. D'Avolio (2002), show similar average levels. These low figures are taken by many analysts as evidence that restrictions must exist that thwart short sellers; since short selling is not done in a centralised market, finding shares can sometimes be difficult or impossible, and hence price may only partially equilibrate supply and demand. We can identify two general types of restriction:

(i) Market structures are not set up to make short selling easy. Less than half the world's exchanges actually allow short-selling (Charoenrook and Daouk (2005); there are regulations and procedures administered by the SEC and Federal Reserve, stock exchanges, underwriters and brokerage firms that can impede the mechanics of short selling, while legal and institutional restrictions can seriously inhibit investors from selling short (see Savor and Gamboa-Cavazos (2005)). The so-called "uptick rule" states that NYSE and AMEX stocks can only be sold short at a price above the immediately preceding reported price (the "plus-tick) or at the last sale price if it is higher than the last reported price ("zero-plus" tick). NASDAQ prohibits its members from short selling stocks at or below the current bid price.

(ii) Deliberate action by firms' management or advisers can be used to hurt short-sellers, e.g. through subterfuge, private investigators, harassment via civil suits, false accusations or appeals to regulators to intimidate short sellers. Technical actions such as stock splits or distributions can disrupt short selling, and management can work closely with shareholders to withdraw shares from the stock lending market. Using a sample of 266 US firms from 1977 to 2002 which had threatened, taken action against, or accused short sellers of illegal activity or false statements, Lamont (2004) finds abnormal returns of around -2% per month in the following year, and returns continue negative for some years to follow, suggesting that short-sale constraints can allow very substantial overpricing which will take some considerable time to correct. The public policy aspects of these restrictions are discussed in Lamont (2003)

There are two extreme views on whether a higher level of short interest conveys positive or negative information on a stock: Diamond and Verrechia (1987) argue that high short interest conveys negative information, with the constraints on short selling raising costs and reducing its incidence by liquidity traders; hence short selling is more likely to involve informed traders, and hence higher levels of short interest reflect (genuine) negative information. On the other hand, what might be called the 'Wall Street' view, is that high short interest is a bullish signal since it represents a 'latent demand' for a stock, which will transform into actual purchases at some point to cover this short position. A so-called third way would have short interest as being essentially neutral for a stock: Senchak and Starks (1993) emphasise how short selling may be driven by hedging strategies, arbitrage transactions and tax related reasons. Indeed Barron's magazine of May 1st, 1995, cites a survey finding that 75% of short interest positions are either hedged or part of some other trading strategy (see also Brent et al (1990)). This latter view would suggest that short interest levels cannot help us predict market price reactions, (see also Chen et al (2002)): this empirical issue has been a prime focus of applied work in this area.

A number of general themes related to short selling have emerged of interest to policymakers and academics:

(i) From the theoretical perspective, do short-sale constraints, including costly transactions, impede the speed of price adjustment to new information? Can they help us understand market "anomalies" and distinguish between mispricing and sources of risk? (e.g. Ali, Hwang and Trombley (2003))

(ii) Do changes in the level of short interest (i.e. lending) for a stock convey positive or negative information about that security?

(iii) From a regulator's point of view, can short sale restrictions reduce the severity of price declines, and hence market stability? Recent studies reviewing global short sale practices have allowed insight into this question (Charoenrook and Daouk (2005)), Bris et al (2003)).

3. Short Selling: Institutional Structure

Despite its importance in the theory of finance, many academic and professional finance practitioners have little precise knowledge of the nature and extent of short selling. While this was perhaps largely due to the lack of publicly available data in this area, this is changing with research based on proprietary information providing new insights. D'Avolio (2002) is such a paper, utilising 18 months of daily loan positions and transaction information for every US equity security on the books of one of the largest (but unnamed) security lenders in the world. Ali and Trombley (2006) describe the short selling process and some of D'Avolio's (2002) key statistics; at the risk of repetition we explain the process in a little more detail as it is generally not well understood.

To short sell a share in company XYZ the seller, Agent A, must find an existing owner of XYZ shares, Agent B, who is both able and willing to lend the shares. Having negotiated the loan of the shares, 'A' may then short sell the borrowed share to any willing purchaser, 'C'.

The short seller (or borrower of the share) 'A' must deposit collateral with the lender, 'B' equal, to 102% of the market value, marked to market daily: according to industry sources, a tiny proportion, around 2%, is collateralised with Treasury

securities, and the rest as cash. If the lender is a US broker-dealer then an additional 50% margin is required, though this is not the case for trades between broker dealers. In the UK and Europe transactions collateralised with cash are less common but they are increasing: collateral may include both government, corporate, and convertible bonds, as well as equities, and is typically 105% of the value of the lent securities (Makinson Cowell, 2005).

So how does 'B' get rewarded for lending the stock? Clearly 'B' has use of the cash collateral for as long as the stock is lent to 'A'; so, the fee 'A' pays 'B' is actually a reverse cashflow (usually!), 'B' paying 'A' a rebate for use of the cash collateral; this rebate rate is analogous to 'repo' rate for bond lending, and comprises the market rate for cash funds less the stock loan fee (which in extreme cases, as we shall see, can be negative). Hence if the cash rate is 4% and the stock loan fee is 1.5%, then the rebate from B to A would be 2.5% (4%-1.5%). If A and B agree to a rebate of -35%, then A in effect pays B 39%, i.e. 35% plus 4% foregone interest. Note that interest is calculated each business day and settled monthly.

One important piece of terminology in the literature distinguishes special stocks from general collateral (or GC): the former refer to stocks with high fees (i.e. low rebates) and the latter to those with the basic fee of around 15 basis points in the US. This came about from another view of the whole process: if we view it as A lending B cash with B offering stock as collateral; if B can replace the collateral with any stock then it is called general collateral, wherein if a specific stock is involved A will hold special collateral, and will charge a lower rate for the cash or Treasury securities on loan at B. 'A' has to replicate and pay any dividends/distributions on the borrowed stock, while B no longer has shareholder rights, such as voting. Lenders rarely recall shares simply to exercise voting rights: there is a consensus, certainly in the UK, that securities "should not be borrowed solely for the purpose of exercising the voting rights" (Securities Borrowing and Lending Code of Guidance, Bank of England Securities Lending and Repo Committee, December, 2004). At the AGM of British Land in 2002 an activist investment fund, Laxey Partners, tabled a motion to unseat the chairman and voted their 9% holding, of which 8% had been borrowed for the purpose of voting (Makinson Cowell (2005)). Disclosure and ownership of such holdings is under review by the Takeover Panel in the UK as of mid-2005.

A key feature of this stock lending procedure is that most lenders, especially institutions, maintain the right to recall the loan at any time, and this may be driven by legal or tax requirements: in the US for pension funds this is an explicit ERISA requirement, while for mutual funds it is required under the Investment Company Act of 1940. Similarly the IRS requires the recall rule for manufactured dividend payments to stay as non-taxable income for certain exempt funds, and for the loan not to be treated as a sale. Hence the loans are effectively rolled over each night until the shares are returned voluntarily or recalled, at which point the borrower 'A' has 3 days to return the share, borrow from another investor, or cover the short sale by buying the share; if after 5 days the shares are not returned to B, the latter has a legal right to use the collateral to buy in the borrowed share on the open market.

Who provides the shares for short selling? The actual transaction is usually effected by large custody banks (e.g. State Street) on behalf of institutional owners, such as pension funds, mutual funds and endowments, with, unsurprisingly, passive indexers the most actively involved in their custodian's lending since their need for specific stocks at any moment in time will be much less than that of an active manager. The natural advantage of custodians as intermediaries here is that they can replace recalled loans from a client by shares held on behalf of other customers, offering a big reduction in disruption and search costs for borrowers. Broker-dealers can also lend from their own market makers and trading desks, or their own institutional customer accounts. Custody banks are the largest and most reliable source of stock for lending.

Who actually gets involved in borrowing the stock? Clearly market makers will have inventory management requirements, while derivatives traders will need to sell short to hedge positions: hedge fund 'long-short' strategies have an obvious need, as do merger and convertible arbitrage strategies.

In the US most stocks can be borrowed. D'Avolio (2002) offers detailed descriptive statistics for the Center for Research in Security Prices (CRSP) universe from his proprietary database for the period April 2000, through September 2001: at most 16% of the 8000 or so stocks on CRSP cannot be shorted, and these account for under 1% of the total market capitalisation; over half of these are under $5 per

share; and around 10% of the stocks are never shorted. The cost of shorting is for the institution's value-weighted lending portfolio, 25 basis points per annum, and only 7% by value is actually borrowed; over 90% of the stocks lent out cost less than 1% p.a. to borrow, and these so-called 'general collateral' stocks have a value-weighted mean fee of 17 basis points; the remaining 9% of loaned stocks are 'specials', having fees above 1% and a mean fee of 4.3% p.a., with less than 1% of stocks becoming 'extremely special', with negative rebate fees, i.e. loan fees in excess of the risk-free rate. Celebrated cases of the latter include GM at 63% and Unilever N.V. at 46% (see Table 4, p.287, D'Avolio (2002)).

In the UK the average (from proprietary data) is considered to be around 14 bp p.a., but is somewhat higher in other European markets at around 40 bp p.a. (Makinson Cowell (2005)). Fees can go as low as 5 bp for large FTSE 100 stocks, or up to 400 bp (and beyond) for smallcap stocks.

Perhaps unsurprising given the sophistication of the intermediation process is that recall is extremely rare, with only 2% of the stocks on loan being recalled in any month in the US, though having been recalled the mean time before the short can be re-established with the lender is 23 trading days. Forced covering of recalled shorts tends to occur when trading volume is at least the daily average. Since the largest suppliers of stock for lending are the large institutions, and these tend to have a higher proportion of large cap, liquid stocks, then passive index funds have a disproportionate presence in the loan market, and constituents of indices such as the S&P 500 are provided in excess supply, and hence are nearly always 'cheap' to borrow, i.e. are 'general collateral'. Finally, what makes a stock 'special' (i.e. expensive to borrow)? D'Avolio (2002) provides an empirical analysis suggesting an inverse relation with market cap and institutional ownership ('supply'), and a role for heterogeneity of investor opinion, 'demand' (e.g. disparate analysts' forecasts, high turnover) (see also Nagel (2006), Chen et al (2002)). This approach is used and extended by Ali and Trombley (2006) to calibrate the relative expense of short selling a stock.

4. Short Selling: Data Issues and Research Implications

However interesting the theoretical and practical issues alluded to earlier, without high quality data there is little opportunity for the financial economist to shed much light on an area. The literature on short selling has exploded over the last few years precisely because new data is finally becoming available, albeit in a selective, proprietary fashion. Whereas CRSP and NASDAQ have offered high frequency data over various time periods for stock prices and related characteristics, short interest data has only been available at monthly intervals, inhibiting event studies and similar methods. Further, the cost of short selling has been almost entirely unavailable until proprietary data has been obtained for studies such as D'Avolio (2002) and Cohen et al (2005). More recently (2005, Q1) NASDAQ has made available intraday data. Only Australia has had a substantial run of real time data identifying short sales (Aitken et al (1998)), and hence such a study is unique whereas in other markets there is an exhaustive array of such research (e.g. LIFFE derivatives' markets, see Buckle, et al (1998a)).

The absence of short sales costs has also proved a thorny issue, since trading strategies/market anomalies based on arbitrage portfolios can be completely misleading, (Ali-Trombley (2006), Nagel (2006)). One exception is the data used by Jones and Lamont (2002) for 90 actively traded stocks per month for the period 1926-1933 (at which point the data was discontinued); these stocks appeared in a centralised stock loan market on the floor of the NYSE, hence indicating high shorting demand. Indeed, some had short selling costs of over 50% per annum: stocks with high costs were associated with low subsequent returns, around 12-24% lower than similar stocks over the following year, again suggesting they were overpriced. This return predictability suggests that short selling costs keep arbitrageurs from forcing down the prices of overvalued stocks, consistent with the 'overpricing' hypothesis.

That D'Avolio (2002) is able to offer direct insights into the short selling costs of a large number of CRSP stocks facilitates the Ali-Trombley (2006) methodology of identifying the factors which make certain stocks expensive to short sell and they use this information in the context of momentum portfolio strategies to see if such predictable returns are actually profitable. Clearly, empirical studies which involve arbitrage strategies should really contain appropriate transaction costs, including potentially substantial short selling costs, before we can feel confident on the

efficacy of any strategy: this has been neglected to date in the literature but surely should become integrated into mainstream anomaly studies when such data becomes available. Indeed, the creation of a reliable database to complement D'Avolio (2002) on the costs of short selling, both across stocks and over time, would seem to be a priority for progress in scientific studies of arbitrage strategies. Cohen et al (2005) go an important stage further in the analysis with proprietary panel data for 4 years on both quantity and cost of short sales, and hence claim to identify separately supply and demand shifts. In other words, a low level of short interest may not indicate low short sale demand but limited supply. They find that it is not so much high loan fees or high quantities of short interest that convey information, but rather shifts in demand for short selling that dominate reductions in supply. Even in a highly sophisticated capital market such as the UK stock market there was much debate prior to average stock lending data being made available monthly on CREST in September 2003 (see Section 8 below).

Hence, research on short-selling has suffered from a dearth of high frequency, appropriate quantity data, the well nigh impossibility of separating quantity data into that associated with hedging and arbitrage from that involving pure bets on price falls, and the almost complete absence of information on the costs of short selling. Hence attempts to identify demand and supply influences must necessarily be incomplete. However, the collation of proprietary data on loan fees by D'Avolio (2002) in particular gave new insights into the cost of short selling which were previously not available. It also allowed calibration of economic influences on these costs, which Ali and Trombley (2006) then extend backwards to 1984 from the D'Avolio (2002) period of 2000-2001, giving themselves a longer data period to examine strategies such as momentum investing. Nagel (2006) investigates the low book-to-market overpricing with references to institutional ownership of shares as a proxy for the lack of short selling supply, though clearly the multi-factor criteria of Ali and Trombley (2006), if robust with respect to individual control variables as well as a summary statistic in the form of an econometric model, should be superior and lends itself to use in similar contexts, where such anomalies/investment strategies are well documented. Ali, Hwang and Trombley (2003) also investigate the book-to-market effect and use institutional ownership as a proxy for short-selling costs, though they also include idiosyncratic stock volatility to capture arbitrage risk

and the number of analysts following a stock as a measure of investor sophistication.

D'Avolio himself (p.274, 2002) acknowledges that the loan fees on his sample do not seem high enough to explain return anomalies or short selling reluctance; after all only around 2-3% of US market capitalisation is short sold at any time. Rather, they are useful in helping understand the limits to arbitrage, and help justify the Ali and Trombley (2006) method of using proxies for loan fees based on observable stock characteristics that capture loan demand by short sellers and available supply combined as one measure reflecting the probability that the loan fee is high. The five factors identified, including firm size and cash flow, can be the basis for separate in depth analysis in parallel fashion. The fact that they omit some of D'Avolio's (2002) unimportant variables is less significant than the assumption that the calibration is robust over an 18-year period. After all, this is an empirical area with a dearth of relevant data and hence it is impossible to conclusively believe in the results. However, given that the momentum returns are found to be robust with respect to both the components of, and aggregate measure of the key variable, short sale constraints, then we should have some confidence in the findings. Nevertheless, since D'Avolio's (2002) loan fee data is only for institutional transactions, and over a limited time-period, complete comfort in loan fee costs is not possible.

5. Short Selling Restrictions around the World

There have recently been two studies seeking to document the extent of short-selling restrictions throughout the world. Bris et al (2003) examine 47 equity markets for the period 1990-2001, quizzing regulators, investment banks and institutional investors on the legality and practice of short-selling, in particular the tax effects of short positions, settlement cycles, and the registration requirements of short-selling. Charoenrouk and Daouk (2005) look at the history of both short-selling and put option trading regulations and practices for 111 countries based on a questionnaire for regulators covering the legality and feasibility of short-selling, and whether put options are available for trading. Since Charoenrouk and Daouk (2005) focus on market wide index returns, their data period extends from 1969 through 2002.

Beginning from Diamond and Verrechia's (1987) insight that short-selling constraints impede the market's ability to rapidly impound value relevant information, both studies exploit the cross-section/time-series nature of their data to address a variety of important policy issues. Bris et al (2003) suggest that markets where short-selling is both legal and practised, show more efficient price discovery, manifesting itself in reduced synchronicity in individual stock returns: more efficient markets have more idiosyncratic risk, and the ratio of firm specific to market information is higher, as agents can act quickly and inexpensively. Using a market efficiency measure developed by Morck et al (2000), they find a negative association between short-sales restrictions and the diffusion of value relevant information into prices. Their second line of enquiry involves the conjecture by regulators that short-selling restrictions can reduce the relative severity of market panics, and this can be tested via examining the skewness of stocks and market indices. There is weak evidence that for individual securities at least, restrictions are associated with less negative skewness, and indeed a lower probability of an extreme negative value. However, this does not carry over to the aggregate market level, where the presence of restrictions does not seem to prevent market crashes. An alternative approach is to look at the case where restrictions were lifted during the sample period: here idiosyncratic risk rose on average by 27%, emphasising the link between restrictions and individual stock behaviour, Charoenrouk and Daouk (2005) also find no evidence that short-sale restrictions affect the level of skewness of aggregate market returns, or indeed the probability of a market crash occurring, though the volatility of stock returns is lower and liquidity is higher. These findings arise from a panel study where the dependent variable is skewness or volatility, or a proxy for market crashes or liquidity, while a binary variable reflecting the country's ability to take short positions appears on the right-hand side, along with various control variables.

6. Short Selling and Stock Returns

A key question for analysts and policymakers is whether short selling actually leads to predictable changes in stock prices. As we saw earlier, one school of thought associated with practitioners is that a build-up of short interest may lead to a rise in stock prices as it represents 'latent demand' for the stock which at some point will

have to be covered. A major problem with establishing a link between short interest and returns is that the former data has only been available in the US as a monthly snapshot and hence high frequency studies which can remove contaminating events have been difficult.

It is no surprise, then, that early research proved far from conclusive, with no clear, unambiguous indication of the relation between short selling and subsequent stock prices: for example, see Seneca (1967), Major (1968), Smith (1968); McDonald and Baron (1973), using a random sample of 100 NYSE stocks for the five years up to 1966 found a direct relation between short interest and risk (i.e. beta), with, on average, a negative return accruing to short-sellers. Figlewski and Webb (1993) also find no strong relation between short interest and abnormal returns, whereas Senchak and Starks (1993) find that stocks with unexpected increases in short interest generate statistically significant but small, negative abnormal returns for a short period around the announcement data.

More recently Woolridge and Dickinson (1994) examined the relation for the NYSE, Amex, and NASDAQ aggregate markets, and also for a random sample of 100 companies for the period 1986-91, the starting date being that at which short-interest data for NASDAQ first became available. Based upon simple regression of returns on changes in short interest, together with control variables such as size and market return, the results 'provide strong refutation of the popular notion that short sellers earn abnormal profits at the expense of less informed investors' (p.20). If anything, the finding of a positive relation between short-selling and returns (adjusted both for risk and market movements) for companies suggests that on average short sellers are actually selling as stock prices rise and reducing short positions as they fall, in other words acting as a moderating, contrarian, force. Overall, they find that a high level of short interest is not necessarily a bullish or a bearish indicator for stock prices, and also that short-sellers on average do not possess superior investment timing skills. Rather, they seem to act as stabilising liquidity providers.

A much improved data offering is provided by the Australian Stock Exchange, ASX, which gathers trade data, including short sales information, and sells it on to brokers and institutions online in real time; hence short selling related activity

becomes transparent very soon after the time of trade execution. Such intraday data lends itself to a high frequency event study, unlike the monthly discrete US data. Using data on all orders placed, as well as trades executed on the electronic trading system of ASX, from 1994-1996 inclusive, Aitken et al (1998) offers a rich descriptive insight into short selling behaviour, and finds an average -0.20% fall in stock value within 15 minutes or 20 trades (see Buckle et al (1998b) for evidence of more rapid adjustment within other markets), offering some evidence in support of the Diamond-Verrechia (1987) hypothesis that short trades are more informative than sell trades due to restrictions on short selling.

Further analysis of US data still had to make do with short interest information at monthly intervals, so the focus turned to more extensive coverage of stocks and to subsets with particular features of interest, such as intensive short selling. Desai et al (2000) examined all NASDAQ listed stocks with any short interest for the period 1988-1994, taking the view that since listing requirements are easier on NASDAQ than NYSE, then informational asymmetry is likely to be greater and hence short interest may well be more informative for NASDAQ stocks. Indeed, they find that 'high' short interest stocks (i.e. those with over 2½% of shares outstanding sold short), have significantly negative abnormal returns -0.76% per month, falling to -1.13% per month for those with short interest over 10%, and in contrast to Aitken et al (1998), such information is gradually absorbed into prices. This suggests strong support for the 'academic' view that short interest is a bearish signal for a stock (Diamond-Verrechia (1987)), and indeed the strength of the signal rises both with the level of short interest and the length of time it is heavily shorted. An interesting adjunct finding is that high short interest is associated with a high rate of delisting and/or liquidation; indeed nearly 13% of firms with a short interest of over 2.5% of shares outstanding are so affected within 36 months.

Lamont and Stein (2003) examine aggregate short interest for both the NYSE and NASDAQ and find that it varies counter cyclically, and that the ratio of put-to-call option volumes displays a similar pattern. Whereas in cross-section data it is generally considered that the most 'overvalued' stocks attract the most short selling demand (see Dechow et al (2001), over time total short interest in NASDAQ stocks during the recent dot-com bubble actually decline as the index approaches its peak; this is consistent with Schleifer and Vishny (1997) who argue that the

open-ended nature of most professional arbitrage firms makes it difficult for these firms to resist aggregate mispricings. This also suggests that short-selling does not act as a stabilising force for overall stock market movements.

The need for improved data for US markets to give a more robust understanding of the nature and implications of short selling is met to some degree by the study of Diether et al (2005). They use newly SEC-mandated tick-by-tick NASDAQ data for Q1, 2005, to look at the link between short-selling activity and future returns. The data allows identification of trade size and the separation of short sales by investors who are subject to rules from market makers who are exempt. A major finding from this new data is that short sales represent on average around 25% of NASDAQ reported shares volume, whereas monthly short interest data reveals a short interest of only 3.3%, suggesting for the first time that a high fraction of short sales in daily volume involves intraday or at least short-term trading strategies, and that the monthly 'snapshot' may well represent window dressing. Of this 25%, two-thirds is short-sales by traders subjects to short-sale rules. The other key finding is that short-sellers are, on average, contrarian, selling short after positive returns, a result similar to Woolridge and Dickinson (1994). Higher short sales predict future negative returns, in some cases up to 5 days ahead, but a trading strategy based on daily short selling incurs costs large enough to remove any profits. It is basically small trades that have predictive power. However, Savor and Gamboa-Cavazos (2005) find that short sellers cover their positions after suffering losses and increase them after gains.

7. Short Selling and Earnings' Announcements

Do short sellers pay particular attention to the quality of earnings and the announcement of earnings? Are they able to exploit earnings' based anomalies? The literature suggests that short sellers both anticipate earnings surprises and trade after earnings' announcements. Cao and Kolasinski (2005) examine whether short sellers exploit two well documented anomalies, namely post-earnings announcement drift and the accrual anomaly; in particular, is the intensity of short-selling related to the severity of the market under/overreactions to earnings and accruals? Indeed, short sellers attempt to exploit both anomalies, though surprisingly perhaps, there is no evidence that prices converge more quickly to

fundamental levels in the presence of short selling. Using (monthly) data from NASDAQ for the period 1995-2003, and looking at short interest for the newest month-long period that begins after the earnings announcement, the study examines returns for 182 days after an earnings' announcement/surprise, it finds that short sellers can earn high returns by short selling stocks that have negative earnings' shocks and high income increasing accruals (the latter being in contrast to Richardson (2003), who looks at accruals in isolation). In contrast Cristophe et al (2004) look at short sales in the 5 days before earnings announcement for a sample of over 900 NASDAQ firms; they find a significant negative relationship between unusual short selling activity before the announcement and the subsequent post-announcement change in stock pricing, suggesting that a significant proportion of short sellers are informed traders. Further analysis suggests that while the transactions are in part influenced by the fundamental characteristics of firms, the selling is more likely to be related to information specific to the forthcoming announcement. Clearly, making short selling information more quickly and readily available could improve market efficiency in this context.

8. UK Experience: Stock Lending, Dividend Arbitrage and Crest

As we noted earlier, data limitations in the US and elsewhere have hindered empirical analysis of short-selling, though this is being gradually reversed. In September 2003, Crest, the UK's stock clearing house began to make available data on what has been described even by practitioners as 'a little known and opaque area of the UK stock market' (see Chambers (2004)), namely stock lending. Crest offers monthly average stock lending positions for FTSE 350 companies (together with some large Irish companies) on its website, www.crestco.co.uk and, more frequently, with a one-week delay, by subscription. However, we should note that not all shares of a stock will be 'in Crest', since this refers to electronic, non-certified holdings of shares. Yet preliminary analysis by Chambers (2004) for FTSE 350 companies finds a close correlation between shares in issue and shares in Crest, and also between the percentage of shares on loan and the proportion held inside and outside of Crest: hence the proportion of stock lending on a particular stock is generally independent of how it is held, and thus Crest data should give a good indication of the extent of stock lending, both by stock and over time. Table 1 below shows the equally weighted average of the stock on loan within the CREST

system to be between 3% and 4½% since the inception in September 2003. However, for individual stocks this can rise to over 40% at various times. Figure 1 shows a simple plot of the stock loan percentage for 3 large UK firms: EGG did not pay a dividend over this period but still had levels above 10% at times, British Aerospace had a clear peak at 25% or more, possibly associated with cash dividend arbitrage (see Makinson Cowell (2005)), while Prudential had notable spikes but at a lower level of around 5% which may reflect scrip dividend arbitrage (again see Makinson Cowell (2005)): daily data for the latter would have revealed much greater percentage spikes.

Of course, not all borrowed stock is for short selling: for example, 'fails management' required stock lending if a clearing transaction fails, say due to a computer failure, and it takes place simply for technical purposes rather than a portfolio trade: hence it is essentially market neutral. Dividend arbitrage is another reason to borrow stocks common to the UK. This may refer to cash dividends, whereby the differential tax rules faced by different investors may be exploited: the Makinson Cowell (2005) review points to French tax rules providing French investors with a 10% tax credit on dividend income which is not available to UK investors. An institution, often a French bank, agrees to borrow UK equities ahead of the dividend record data in order to receive the dividend payment. Clearly this borrower can derive a greater net dividend return from the stock than the lender, and hence can compensate the lender and still profit. Such stock lending activity can be very significant, raising to above 10% of stock in Crest around dividend dates for FTSE 100 companies, compared to a year round average of 5% or less. A related source of borrowing stocks is scrip dividend arbitrage, whereby an issuer offers shareholders the choice of receiving a cash dividend or a scrip dividend at a discount to market price, but certain funds, such as index traders, cannot take the scrip alternative as their holdings would become larger than allowed under their portfolio guidelines. In this case, stock can be lent out with the borrower choosing the script alternative and selling in the market and using the proceeds to pay the lender the cash dividend, with the borrower making a profit equal to the difference between the market value of the shares and the cash dividend, less the stock lending fee. The lending period for this activity is much shorter than for cash dividend arbitrage and the percentage of Crest stocks lent out can jump above 20% from an average of 2% in certain instances.

9. Concluding Comments

If overpricing of costly-to-short sell, low book-to-market stocks generates a big part of the book-to-market effect (Nagel (2006)), Ali, Hwang and Trombley (2003)), and similar conclusions apply to the overpriced losers in Ali and Trombley (2006), then a new insight is emerging that puts short sales constraints at the centre of our understanding of certain investment strategies/market anomalies which rely on some categories of stocks becoming overpriced. Nagel (2006) sees much of the value premium arising from market segments where its existence appears to be most consistently explained by mispricing and short sale constraints, rather than by covariance with some underlying risk factor. Hence just as book-to-market has entered textbook asset pricing as part of a 'three-factor' model, so short selling constraints appear to challenge this approach with an alternative interpretation: if arbitrage costs exceed arbitrage benefits than systematic mispricing may persist (Schleifer and Vishny (1997)). Similarly, momentum, while not given quite the same exposure as a factor as 'value', may also be considered to be at least partly explicable by short sales constraints. Ali and Trombley (2006) do much more than construct 'a reliable index of short sales constraints using easily observable stock characteristics'; their results suggest that other predictable return regularities should be investigated to assess the importance of short sales constraints in these processes. Ofek et al (2002) establish the importance of such costs for options strategies.

Most investors never short sell, yet for most large capitalisation stocks it is not difficult to short sell; we still do not know why so little short selling takes place. Constraints which are difficult to calibrate, such as information shortfall, cultural, risk perceptions, and institutional behaviour may be behind this. Yet the more persuasive evidence presented here suggests that short sales are a stabilising (contrarian) force and their introduction into a wide variety of countries has not been associated with an increased likelihood of a financial crash. However, more conclusive analysis of the role of short sales on investment regularities requires data on both the quantity and price of short selling at a higher frequency than is currently available.

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Figure 1

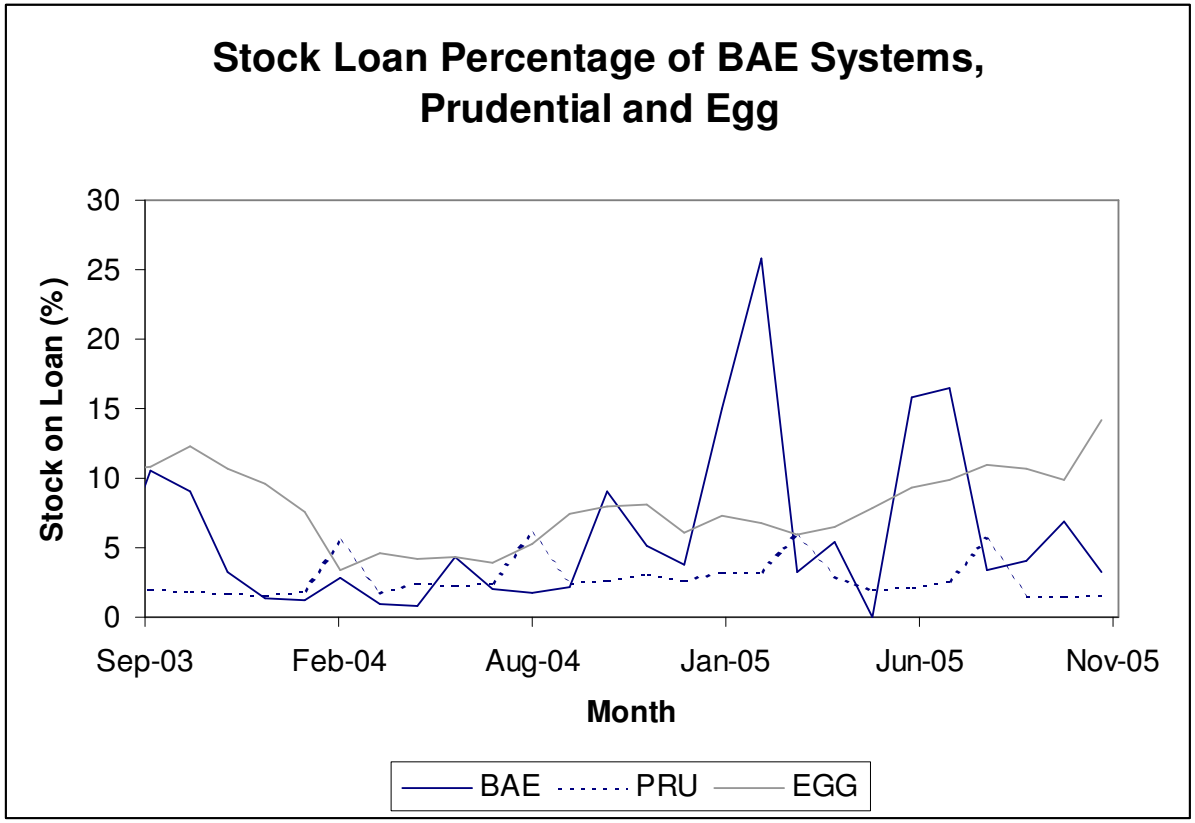
Stock Loan Percentage of BAE Systems, Prudential and Egg
Stock on Loan (%)
30
25
20
15
10
5
0
Sep-03
Feb-04
Aug-04
Jan-05
Jun-05
Nov-05
Month
BAE
PRU
EGG

Table 1

Summary Statistics for the Average Monthly Stock on Loan in the CREST System Sep 2003 – Nov 2005

Month	Average Stock on Loan per Company (%)	Maximum Stock on Loan for Individual Company (%)	Minimum Stock on Loan for Individual Share (%)
Sep-03	3.09	38.66	0.00
Oct-03	3.22	42.01	0.20
Nov-03	3.16	43.52	0.11
Dec-03	3.09	45.09	0.19
Jan-04	2.99	43.39	0.11
Feb-04	3.15	39.85	0.11
Mar-04	3.44	44.58	0.15
Apr-04	3.47	41.01	0.09
May-04	3.69	42.90	0.16
Jun-04	3.72	42.80	0.00
Jul-04	3.98	42.22	0.00
Aug-04	4.24	43.08	0.00
Sep-04	4.29	44.87	0.16
Oct-04	4.14	25.84	0.13
Nov-04	4.05	29.97	0.14
Dec-04	3.66	27.55	0.12
Jan-05	3.35	23.85	0.19
Feb-05	3.55	25.81	0.11
Mar-05	3.88	23.00	0.04
Apr-05	4.20	25.85	0.05
May-05	4.16	26.13	0.02
Jun-05	4.02	28.55	0.15
Jul-05	4.06	21.79	0.02
Aug-05	4.09	24.49	0.27
Sep-05	4.15	24.02	0.14

Oct-05	4.29	23.75	0.13
Nov-05	4.50	29.38	0.12