

# Efficiency and the Bear: Short Sales and Markets around the World\*

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Abstract: We analyze cross-sectional and time series information from forty-seven equity markets around the world, to consider whether short-sales restrictions affect the efficiency of the market, and the distributional characteristics of returns to individual stocks and market indices. Using the approach developed in Mørck et al. (2000) we find significantly more cross-sectional variation in equity returns in markets where short selling is feasible and practiced, controlling for a host of other factors. This evidence is consistent with more efficient price discovery at the individual security level. A common conjecture by regulators is that short-sales restrictions can reduce the relative severity of a market panic. We test this conjecture by examining the skewness of market returns. We find weak evidence that in markets where short selling is either prohibited or not practiced, market returns display significantly less negative skewness. However, at the individual stock level, short sales restrictions appear to make no difference.

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## I. Introduction

In February of 1609, a group of well-connected Dutch businessmen, led by one of the original subscribers to the Dutch East India Company, Isaac Le Maire, formed a secret association, a “Groote Companie,” to short the shares in the East India Company in anticipation of the incorporation of a rival French-chartered trading firm. Le Maire and his colleagues sold shares forward in a “blanco” transaction promising future delivery in one or two years. Over the next twelve months, their profits mounted, as East India Company shares dropped by 12%, angering shareholders who inevitably learned of their plan. In January of 1610, a year after the formation of the “Groote Companie” and only three years after the official founding of the Amsterdam Exchange, the first regulation against short selling was enacted. Share prices rebounded, a rival French company was not formed and Isaac Le Maire never succeeded in disentangling himself from the litigation that ensued.<sup>1</sup>

At various times over the next four hundred years, short-sellers have been blamed for stock market declines, and market participants have called for regulation against short sales.<sup>2</sup> However, despite centuries of disagreement between speculators and regulators on the topic, no one really knows whether short-sales constraints are a good or a bad thing. As the above example indicates, short-sales restrictions are nearly as old as organized exchanges, and yet there is little empirical evidence on whether they prevent or facilitate market crashes, or whether they hinder or help rational price discovery.

In this paper, we use cross-sectional and time series information from forty-seven equity markets from around the world to examine the question of whether short-sales restrictions affect

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<sup>1</sup> This account is taken from Montias, John Michael, 1989, *Vermeer and His Milieu*, Princeton Press, Princeton, p. 20. The original study of the Le Maire affair may be found in J. G. van Dillen, 1930, “Isaac Le Maire en de handle in action der Oost-Indische Companie,” *Economisch-historisch Jaarboek* 16:46, 107-111. For a discussion on the legal and ethical view of short-selling in late Sixteenth Century Holland, see De Marchi and Harrison (1994).

the efficiency of the market and the distributional characteristics of individual as well as market returns. We obtain information regarding the history and current practice of short-sales restrictions from market regulators, investment banks, and institutional investors specialized in short sales. This dataset allows us to characterize each country in terms of the legality, as well as the practice, of short selling for the period 1990–2001.

Because the existence of short sales regulation is highly correlated with the development of financial markets, our challenge is to identify the true effects of such regulation on measures of efficiency and market stability that are not driven by other country-specific characteristics. Moreover, in our sample there are only five countries that have changed their regulation over the sample period, hence identification in the time-series dimension is problematic. However, one of the most significant institutional changes in international investing in the last decade has been the growth of the depository receipt market in the U.S. and Europe. Once restricted to a very few bell-weather securities from a handful of non-U.S. exchanges, ADRs, GDRs, and Global Issues now allow domestic investors to achieve considerable exposure to the world equity markets without leaving the comfort of the U.S. or the U.K. regulatory environment. A major factor in this domestic environment, of course, is the ability to short a stock. Therefore, we are able to identify, even within countries where short sales are not allowed / not practiced, a subsample of stocks that can be sorted because they are listed both in the domestic market and in either the U.S. or the U.K. Once we control for the effects of a dual listing on the domestic stock, our differences-in-differences estimator isolates the effect of short sales regulation on equity prices. That is, we estimate differences in behavior of non-shortable stocks (only domestic) vs. shortable stocks (dually listed) in countries where short sales are restricted,

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<sup>2</sup> For an excellent review of the history of short-sales restrictions, see “A Short History of the Bear,” by Edward Chancellor, October 29, 2001, copyright David W. Tice and Co.  
[http://www.prudentbear.com/press\\_room\\_short\\_selling\\_history.html](http://www.prudentbear.com/press_room_short_selling_history.html)

controlling for differences between domestic stocks and dually-listed stocks in countries where short sales are allowed and practiced.

With respect to measures of market efficiency we find, using the approach developed in Mørck, Yeung and Yu (2000) [MYU], significantly more cross-sectional variation in equity returns in markets where short selling is feasible and practiced, controlling for a host of other factors. This evidence is consistent with more efficient price discovery at the individual security level.

A common conjecture by regulators is that short-sales restrictions can reduce the severity of price declines. We test this conjecture by examining the skewness of market returns. We find some evidence in favor of the conjecture. That is, we find that the lifting of short-sales restrictions is associated with increased negative skewness in market returns. Our result is thus consistent with the regulatory views of Samuel Untermyer, legal counsel to the 1913 Pujo Committee of Congress investigating money trusts. In his devastating questioning of Frank Stugis, president of the New York Stock Exchange from 1894 to 1898, Untermyer succinctly articulated the public fear of short selling during a financial crisis.

Untermyer: Under what circumstances would you regard... short selling as legitimate and proper?

Stugis: I should regard it so if there was a panic raging over the country and it was desirable to protect interests which could not be sold. I think it would be a perfectly legitimate thing to do.

Untermyer: Let us see about that. If there was a panic raging over the country and a man sold stocks short, would not that simply add to the panic?

Stugis: It might. Self preservation is the first law of nature.<sup>3</sup>

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<sup>3</sup> Untermyer, Samuel, 1915, "Speculation on the Stock Exchanges and Public Regulation of the Exchanges," *American Economic Review*, 5(1) Supplement, Papers and Proceedings, pages 24-68.

This view is echoed by one of the regulators whom we contacted to obtain data for our sample. In his words: “forbidding short selling prevents big market swings since the market size is limited.” Our analysis sheds light on the costs and benefits of short-sales regulation at the individual security level and at the market level. On the one hand, our data strongly support the view that short selling facilitates efficient price discovery—at least to the extent that efficiency is captured empirically by the lack of synchronous movement in daily returns. On the other hand, short selling may also facilitate severe price declines in the market, at least as defined in terms of negative skewness. Despite the relationship between short sales constraints and skewness at the market level, we find little compelling evidence those short-sales constraints prevent or mitigate severe price declines at the individual stock level. Furthermore, we do not find that short-sales constraints prevent market crashes, where market crashes are defined as negative returns below two standard deviations. Figure 1 summarizes our findings regarding the skewness of the market and the synchronicity of stock returns. We plot both variables depending on whether countries allow and commonly practice short sales or not. Furthermore, we exclude from the figure dually-listed stocks in countries where short sales are not allowed / not practiced. In this figure we do not control for a number of factors that potentially influence co-movement and skewness, however the raw data is somewhat instructive. Countries in which short-sales are practiced display less co-movement and modestly more negative skewness.

[Insert Figure 1 here]

Note that some countries — Hong Kong, Malaysia, Norway, Sweden, and Thailand — appear twice on the figure. This is because they lifted short-sales constraints in the period of our study. For example, short-sales restrictions for Sweden were eliminated in 1991. Before that date, 97 percent of the stocks moved together, and the market skewness was  $-0.47$ . In the period since 1991, the co-movement of stocks declined to 83 percent, and the market skewness

increased to 0.18. Sweden's positional shift in the figure is the common pattern among the countries that relaxed short-sales constraints.<sup>4</sup> The international evidence shown in Figure 1 at least suggests that short-sales might play an important role in efficiency and market crash probability. In the remainder of this paper, we investigate these potential relationships in econometric detail.

The paper is organized as follows. In the next section we review the current literature on short-sales and discuss our contributions in the context of related research. In Section 3 we summarize the range of short-sales regulations and practices in markets around the world. In Section 4 we describe the classification of stocks within a country into domestic and dually-listed. Section 5 reports the results of the MYY test of relative pricing efficiency. Section 6 reports the statistical characteristics of market and security returns associated with short-sales and tests for differences in skewness conditional upon restrictions. Section 7 concludes.

## **II. Literature Review**

Short-sales play an important role in asset pricing models and the theory of portfolio choice. Most neo-classical models in finance (c.f. Ross, 1976) rely upon the ability of market participants to take off-setting positions in close economic substitutes in order to enforce a law of one price. Considerable research in the last decade has explored the effects of short-sales and frictions in an asset market. For example, Luttmer (1993), Chen (1995, 2001), He and Modest (1997), Hansen and Jagannathan (1997), Jouini and Kallal (2001), Duffie, Garleanu and Pedersen (2002) all address the effect of market frictions and seek to characterize the magnitude of mispricing that may obtain. Diamond and Verrecchia (1987) explore the effects of short-sales constraints on the speed of price-adjustment to private information. Recently, Hong and Stein

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<sup>4</sup> Section VI.A in the paper shows that the difference in skewness before and after the change in regulation is not

(2002) develop a heterogeneous agent model linking short-sales constraints to market crashes. In their model, if some investors are constrained from selling short, their accumulated unrevealed negative information will not be manifest until the market begins to drop, which further aggravates market declines and leads to a crash. They motivate the model with the observation that the U.S. market displays negative skewness.

Most of the research cited above suggests that short-sales constraints have an adverse effect on efficiency—the only question is how much. On the other hand, an interesting exception is the argument of Allen and Gale (1991) who point out that the potential for financial innovation renders short selling a destabilizing influence in the economy. This is potentially interesting in light of our findings that short sales tend to be allowed in major markets where financial innovations occur—particularly with respect to capital structure and new security development -- and that these markets also tend to display relatively higher negative skewness in returns. Bernardo and Welch (2004) develop a model describing how the fear of financial crisis, instead of a real liquidity shock, is the true cause of financial crises. One implication of their model is that putting constraints that hinder some market participants from front-running other investors can effectively prevent financial crisis from happening, supporting the finding of Allen and Gale (1991) that short sales can potentially destabilize the economy.

Empirical evidence on short selling largely supports the theoretical view that constraining it hinders price discovery. In a recent paper, Jones and Lamont (2002) use early 20<sup>th</sup> Century U.S. data to show that stocks which are expensive to short have high valuations and low subsequent returns. Their finding is consistent with the hypothesis that difficult-to-short stocks are overpriced. Using data on DotComs, Ofek and Richardson (2002) show that short-sales constraints, in the form of stock option lock-ups, have considerable and persistent negative impact on

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significantly different from zero.

subsequent stock returns, also supporting the argument that stock prices do not fully incorporate information under short-sales constraints. Geczy, Musto, and Reed (2002) use a comprehensive dataset of short sales, and find that short-selling restrictions have a mixed impact on the profitability of well-known arbitrage strategies.

Short selling requires the ability to borrow securities. As we will discuss in this study, securities borrowing and lending can directly determine the costs of short selling and hence should be considered in conjunction with short-sales constraints. In our empirical analysis, we classify countries into categories according to whether short selling is practiced. Although short selling is allowed in some countries, securities borrowing and lending is so limited that short sales are not really feasible. D'Avolio (2002) provides empirical evidence about securities borrowing and lending in U.S. stock markets that demonstrates considerable cross-sectional variation in the feasibility of maintaining short positions, depending on the divergence of market opinion.

Short selling is an important tool used by speculators to exploit over-priced securities. Bekaert and Harvey (2000) explore the importance of speculators in emerging market efficiency. They find that the cost of capital, an indicator of market efficiency, decreases after a capital market liberalization. They stress the importance of a regulatory change to a country's openness to speculators—this would naturally extend to short-sales restrictions and thus our work fits naturally into the literature on the globalization of capital markets. Harvey and co-authors have also contributed to our knowledge about skewness in returns, although their findings are not explicitly connected to capital market regulatory changes *per se*. In a series of studies, Harvey and Siddique (1999, 2000a, 2000b) point out that return skewness appears to be priced in both the U.S. and the world capital market. If regulators believe that short selling regulation can indeed prevent market crises, then Harvey and Siddique's research suggests that

there should be implications for expected returns and volatility in financial markets around the world.

There are a few key empirical studies that seek to understand the impact of short-sales regulations on return distributions using international data. Aitken et al. (1998) offer evidence from the Australian Stock Exchange suggesting that short sales trades reflect significant bad news about companies. Poitras (2002) concludes that rights issues trade below the arbitrage boundary because of short sale restrictions on the Stock Exchange of Singapore (SES). Biais et al. (1999) use data from the Paris Bourse and show that a market with short-sales constraints reflects good news significantly faster than bad news. Li and Fleisher (2002), using Chinese stock market data, find that the dispersion of domestic analysts' forecasts is negatively correlated to stock returns in the A-share market, where short-sales restrictions are binding, and not significantly related to the return of B-shares where short-sales restrictions are not binding. Studying the impact of short-sales constraints in an international setting avoids potential country specific factors and generalizes the findings on short-sales regulations.

In sum, most theory and empirical evidence from the U.S. and non-U.S. markets suggest that short-sales constraints are an impediment to price discovery—particularly when the news is bad. Some theories argue that limiting short-sales may be necessary under certain conditions to achieve equilibrium, however thus far there is no empirical test of the contrary proposition.

### **III. Short-Sales Restrictions Around the World**

Our main data source for short-sales regulation and practice is information provided by investment banks. The Morgan Stanley Dean Witter Global Network Management Division (GNM) has compiled information regarding short-sales regulation, impediments and practices from their global network of sub-custodian banks for 59 countries, and they made a summary of

this research available to us. We obtained similar information from the International Securities Lending Division at Goldman Sachs (ISL). The ISL complements the information from GNM in two important aspects. It provides detailed information on the tax effects of short positions, the settlement cycle of short sales, and the registration requirements for shorting in 46 countries. There are some countries for which the GNM and ISL data indicates that short selling is not practiced despite the fact that a widely used guide, the *Worldwide Directory of Securities Lending and Repo* (WDSLPR), lists institutional investors involved in short sales in those countries. In these cases, we contacted the listed institutions to understand the discrepancy. In most cases we found they were not active in short sales, or else they were mostly focused on securities lending. An exception is Singapore where it appears that, even though short selling is not formally allowed, it is widely practiced, although short sales are typically executed off-exchange between depository agents. We obtained additional information on securities trading, settlement and tax laws from the International Securities Services Association (ISSA) Handbook, however ISSA only provides current information on these issues.

In addition to information provided by investment banks, industry publications and market participants, we contacted the equivalent of the Securities and Exchange Commissions of the 59 countries in the GNM dataset to learn what we could from them about regulation and practice. Information from market regulators was particularly useful in allowing us to track the history of short-sales regulations for each country over the last fifteen years. With their help we are able to examine some key regulatory regime shifts in our empirical analysis. We found in general that the information provided by practitioners was more detailed than the information from regulators, although it should not be surprising that Goldman Sachs and Morgan Stanley Dean Witter know more about market practice than regulators themselves. For instance, in one case, regulators told us that short-selling was not practiced in their market, while ISL indicated

that most of the short-selling transactions for that market take place offshore—outside the purview of the regulatory agency. What regulators may lack in specific knowledge about market practice they typically make up for in interest in the current project. Many of the regulatory agencies we contacted expressed a strong desire to learn the results of our study, because the question of the efficacy of short-sales restrictions continues to be an issue of interest.

Our information about short-sales regulations and practice is summarized in Table 1. Out of the 59 countries in the GNM dataset, we exclude the countries for which we could not find individual firm stock price data. This leaves a sample of 47 countries. In 35 of them, short selling is currently allowed, at least as of December 2001, the final date of our sample period. In 12 of these 47, short-sales were prohibited for the entire sample period of January, 1990 to December, 2001. In 12 of the 35 countries where short-sales are currently allowed, restrictions existed in 1990 but were lifted at some point within the sample period. These countries are: Chile, Hong Kong, Hungary, Malaysia, New Zealand, Norway, Philippines, Poland, Spain, Sweden, Thailand, and Turkey. In three cases—Malaysia, Hong Kong, and Thailand—restrictions on short selling were removed and later re-enacted gradually.<sup>5</sup>

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<sup>5</sup> In Malaysia, the Securities Commission issued in December 1995 the Guidelines on Securities Borrowing and Lending, and the Securities Industry Act of 1993 was amended to allow short sales. The regulatory changes came into force on March 7, 1996, and allowed the local exchange—the Kuala Lumpur Stock Exchange—to enact short-selling rules. With that, regulated short selling commenced on September 30, 1996. However, in August 28, 1997, and in the onset of the Asian financial crises, these activities were suspended as interim measures to prevent excessive volatility in the markets. In February, 2001 the Securities Commission launched a plan—the Capital Market Masterplan—that recommended the re-introduction of short selling and securities lending activities.

In Hong Kong, short selling was prohibited before January 3, 1994. The SEHK then allowed 17 out of the 33 constituent stocks of the Hang Seng Index (HSI) to be sold short subject to several restrictions. These restrictions were lifted on March 25, 1996 at the same time that 113 of the firms listed on the exchange, including all the constituent stocks of the index, were allowed to be sold short.

In Thailand, the Securities Exchange Commission first enforced short-sales regulations on July, 1997, suspending them because of the currency crises. Beginning on January 1, 1998, short sales were allowed again in the Thai capital market, through financial institutions licensed to operate securities borrowing and lending (SBL) business. The practice of short selling has increased gradually: in 1999 there were only three securities companies licensed to operate SBL. Although ISL and GND characterize Thailand as a country where short sales are a common practice, market regulators were aware of only one transaction since 1997, apart from “mistaken” transactions done by brokers.

There is clearly a difference between what the law allows and what is common practice. Although short selling is currently legal in most countries, it is only practiced in 28. In some countries, tax rules make shorting very difficult. In Chile for instance, although short selling and securities lending have been possible since 1999, they are rarely used because lending is considered an immediate, taxable sale. Given that there is no sale price, the relevant price is the highest price of the stock on the day it is lent; if it is higher than the purchase price, capital gains tax will apply. In Turkey, stock lending is treated as a normal transaction by the tax authorities, and as such it is liable to capital gains tax where applicable. In Finland, transfer laws also place a serious burden on this activity. In countries like the Philippines or Turkey, short selling is allowed, but the rules are not yet clearly defined. In Thailand, evidence of the practice is murky. Regulators in that country believe that short selling is not practiced because the market for borrowing stock is very narrow, especially on the supply side, due to the absence of a futures market.

[Insert Table 1 here]

There are some other features of short-selling practices throughout the world that are relevant for our purposes. In some markets only the largest and most liquid stocks may be shorted. Until 1996, Hong Kong only allowed short sales in securities specifically designated by the Hong Kong Exchanges and Clearing Ltd. A similar rule currently operates in Greece. More objective criteria are found in Poland, where any security with a market capitalization of at least 250 million zloty qualifies. We adopt the convention of classifying Hong Kong as a country where short selling is allowed only after 1996, even though it was allowed for a subset of stocks beginning in 1994.<sup>6</sup> For Poland and Greece, GNM reports that short selling is not practiced.

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<sup>6</sup> See footnote 5.

We also regard short selling as allowed and practiced in a country even if some investors are prohibited from entering into these transactions. In Sweden, for example, traders can go short without having borrowed the shares in advance,<sup>7</sup> while individual investors must borrow the shares before they go short. In Greece prior to 2001, short selling was only available to the members of the Athens Derivatives Exchange. Some countries only impose short-sales restrictions on foreign investors. In Brazil, for instance, a short seller must have a domestic legal representative. In India, foreign investors are prohibited from short selling. It is fair to say that for every country in our sample, there exist a constellation of laws, regulations, institutional norms, variation in practice and fine print governing the ability to take and maintain a short position in a stock. Our challenge in this paper has been to categorize them in economically meaningful ways.

Although the actual practice of short selling depends upon laws, regulation, frictions and costs in markets, we are initially forced to reduce the complexities to a single dimension for purposes of analysis. We classify countries in our sample into four groups, depending on whether short selling is legal and practiced. This classification of course misses the nuances of expenses and risks that potentially characterize differences in short selling across international markets. In the next section we describe how we further classify stocks within a country into shortable and non-shortable, even in the case where short sales are not allowed / not practice.

We therefore end up with two groups of countries. In the first group we have the countries where short selling became legal some time before 1990, and where short selling is currently practiced. This group includes the U.S., the U.K., Australia, Austria, Belgium, Canada,

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<sup>7</sup> They must borrow the stock before the end of the day, however.

the Czech Republic,<sup>8</sup> Denmark, France, Germany, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Portugal, South Africa, and Switzerland. The second group consists of countries in which short sales were prohibited as of December, 2001. These are: Colombia, Greece, Indonesia, Jordan, Pakistan, Peru, Singapore, the Slovak Republic, South Korea, Taiwan, Venezuela, and Zimbabwe. The third group is comprised of countries in which short selling is allowed but rarely practiced: Argentina, Brazil, Chile, Finland, India, Israel, New Zealand, the Philippines, Poland, Spain,<sup>9</sup> and Turkey. Finally, the remaining five countries—Hong Kong, Norway, Sweden, Malaysia, and Thailand—comprise a group for which short-sales regulation and practice changed sometime between January, 1990 and December, 2001.

#### **IV. Equity Market Data and Sources**

The international return, volume and issue data for the 47 markets in our study come from Datastream, and our U.S. data come from CRSP. Prices and returns are measured in local currency. We construct value-weighted market indices for each country in the sample. It is important to note that the number of firms per country varies across years, and thus the volatility of the market index might vary with time as a consequence, since there are typically fewer constituent firms in the indices for some countries in the earlier years of the sample.<sup>10</sup> For this reason we estimate a year-fixed effects model in most of our statistical analysis.

We obtain accounting data from Worldscope for non-U.S. firms, and Compustat for U.S. firms. We also obtain country information from the Economist Intelligence Unit database and

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<sup>8</sup>The Prague Stock Exchange was established on November 1992, and the automated trading system started operations in January 1993. We include the Czech Republic in the group of countries where short selling is allowed and practiced, although we only have data on Czech firms since 1993.

<sup>9</sup>Chile made short selling legal only in 2000, but there is no current practice. Spain legalized short selling in 1992, but only securities lending facilities are common among institutions, as a way of facilitating hedging strategies.

<sup>10</sup>Datastream has an acceptable coverage only after 1995.

from the World Bank. In particular, we characterize each country in our sample by its geographical size, the GDP per capita, and the variance of GDP growth. Finally, we construct an index of good government following MYY, as the sum of indices of corruption, risk of government repudiation of contracts, and risk of expropriation of private property in La Porta et al. (1997).

### **Foreign Listing and Short Selling**

The classification of countries into two categories is not perfect. Even when short sales are either not allowed or not practiced, some stocks in a country can still be shorted. A good example is Nokia, which represents about 2/3 of the total market capitalization of the Helsinki Stock Exchange (HEX) in 2001. As per our own data, Finland is a country where short sales are not practiced. However, Nokia has been listed on the New York Stock Exchange since July 1, 1994. These Nokia depository receipts can be shorted, although only in the U.S.<sup>11</sup> Thus, taking into account shares that list abroad, the percentage of the Finnish market that is shortable is 70.29 percent on average between 1999 and 2001 (see Table 2). Hence, these shortable components of national exchanges must be considered when examining the effects of short-sales restrictions on markets.

We compile data on non-U.S. companies that list in NYSE, Nasdaq and the LSE. We obtain data on U.S. listings directly from the NYSE.<sup>12</sup> Data for the London Stock Exchange comes from the Exchange's website. We obtain the date of the first listing of each foreign firm in these markets via direct listing (IPO), ADRs (in the U.S.) and GDRs (in the U.K.). We also

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<sup>11</sup> Indeed, there are five Finnish companies in our database that list in the U.S.: Nokia (direct listing in NYSE since 7/1/94), Metso Corporation (direct listing in NYSE since 7/1/99), Stora Enso Oyj (ADR in NYSE since 9/1/00), UPM-Kymmene (ADR in NYSE since 6/29/99), and Instrumentarium Corporation (ADR in Nasdaq since 8/18/83).

obtain from Datastream stock market information about all firms listed in the 47 countries in our database. Bris, Goetzmann, and Zhu (2004) show – using the same dataset – that without taking foreign listings into consideration, the percentage of the world market capitalization that is shortable varies between 89.35 percent in 1994 and 94.15 percent in 1999. When foreign listings are included, they show that up to 96.29 percent of the world market is shortable as of 2002. The numbers are very similar even they exclude the U.S. markets from the calculations.

[Insert Table 2 here]

In Table 2 we specifically consider the countries where short sales are not allowed or not practiced, but where there are firms that list in a U.S. or U.K. market. The table illustrates the changing importance of cross-listings through time. The aggregate percentage of shortable capitalization via depository receipts for all short-sales restricted countries shows a moderate but significant increase from 29 percent in the early period 1990-1993 to 36 percent in 1999-2001. However in some countries the shortable capitalization is considerable: in Argentina, Finland, and South Korea, more than 50 percent of the market is shortable via cross-border listings in 1999-2001. In Argentina, the percentage of the market capitalization that is shortable increases from 3 percent in 1990-1993, to 50 percent in 1999-2001.

Our final sample of countries and regulations includes then 47 markets. Within each market, we classify stocks into two groups, depending on whether the stocks are dually listed or not. In countries where short sales are not allowed / not practiced, the dually-listed stocks constitute a group of stocks that are actually shortable. By analyzing the differences between domestic (stocks without a foreign listing) and dually-listed stocks, in the domestic market, and by comparing these differences with the control sample of stocks in countries where short sales

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<sup>12</sup> We thank Gustavo Rodríguez from the NYSE for providing us with these data.

are allowed and practiced, we are able to identify the effect of short-selling restrictions on the variables of interest.

For simplicity, in the remainder of the paper we call 'ADR stocks' the group of stocks within a country that list abroad. Obviously these are always shortable stocks, and we analyze the price behavior of these stocks in the domestic market. We call countries without a foreign listing 'Domestic Stocks'. These are shortable only in countries where short sales are allowed. Table 3 shows the descriptive statistics of the variables we use, for each of the four groups of stocks in the sample. In the cross-sectional regressions below, we only use groups of firms where the number of observations is at least five firms.

[Insert Table 3 here]

## **V. Short-Sales Restrictions and the Co-movement of Stock Returns**

The first question in our analysis is whether short-sales restrictions play a role in efficient price discovery. The key implication of Diamond and Verrecchia (1987) for example, is that short-sales constraints impede the market's ability to rapidly impound value-relevant information. As the voluminous literature on the efficient market theory suggests, there is no universal test for relative market efficiency, although event studies and filter rules have a long history of application. An important recent contribution to the literature on market efficiency is MYY's observation that more efficient markets can be expected to have more idiosyncratic risk, since the ratio of firm-specific information to market-level information is likely to be higher in informational environments that allow market participants to acquire information and act quickly and inexpensively upon it. MYY examine international differences in the degree of co-movement in stock prices across countries around the world, and find that the ratio of

idiosyncratic risk in relatively developed markets is higher than in markets that are commonly viewed as less developed—particularly emerging markets. In our analysis, we use the MYY measure as a proxy for market efficiency, and then test whether cross-sectional differences in short-sales constraints correlate well to it.

*a. Measures of Price Synchronicity*

Following MYY, for each country in our sample, for every year, and for domestic and ADR stocks, we calculate two aggregate measures of individual security co-movement.

We compute the ratio:

$$f_{it} = \frac{\max[n_{it}^{up}, n_{it}^{down}]}{n_{it}} \quad (1)$$

where  $n_{it}$  is the number of stocks in country  $i$  and week  $t$ ,  $n_{it}^{up}$  is the number of stocks whose price rise in week  $t$ , and  $n_{it}^{down}$  is the number of stocks whose price fall. We then average the  $f$ 's across countries, type of stock, and years, that is:

$$f_{iDT} = \frac{\sum_{t=1}^{\delta_{iTD}} f_{it}}{\delta_{iTD}} \quad (2)$$

where  $\delta_{iTD}$  is the number of trading weeks in country  $i$  and year  $T$ , in category  $D=\{\text{Domestic, ADR}\}$ . For most countries we have then two observations per year. The ratio of stocks moving together varies between 0.5 and 1, numbers closer to 1 indicate more co-movement. MYY argue that more co-movement implies less efficient price discovery in the market, since stock specific information is presumably the driver of any deviation in co-movement among stocks. Thus, cross-sectional idiosyncratic risk is another potential way to capture this intuition. We thus also compute the  $R^2$  for regressions of the form:

(3)

$$r_{ijt} = \alpha_{ij} + \beta^M_i r_{mjt} + \beta^W_i r_{wt} + \varepsilon_{ijt}$$

That is, we regress weekly stock returns on the value-weighted market return,<sup>13</sup> and a value-weighted world index for every firm  $i$  and in every year (where week  $t$  belongs to year  $T$ ). We then average the  $R^2$ s for each country  $j$  and for every year  $T$  and group  $D$ , as in MYY:

$$R^2_{jTD} = \frac{\sum_i R^2_{ijtD} SST_{ijtD}}{\sum_i SST_{ijtD}} \quad (4)$$

where SST is the sum of squares in regression (3).

MYY find that developing economies display significantly higher levels of co-movement than more developed ones. In particular, they find that co-movement is explained in the cross-section by the GDP per capita. They provide several hypotheses why this can happen, and show that, when interacted with an index of good government, the significance of the GDP per capital disappears.

One potentially important explanation for such a pattern is that smaller countries have less-diversified stock markets. To address this issue, MYY use country-level and industry-level Herfindahl indices. The former captures the cross-industry concentration based upon sales, the latter captures the average within-industry concentration based upon sales. To see how this might work, consider some extreme examples: Finland and Norway vs. the U.S. In Finland, Nokia represents more than 50% of the market capitalization of the Helsinki Stock Exchange. In terms of domestic sales, the telecommunications giant accounts for 5% of the total sales in the

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<sup>13</sup> The market return is calculated for each subgroup of stocks ---stocks with and without foreign listing--- within each country and year. Therefore there are two market returns in each country. Our results do not change if we estimate regression (3) using the overall market index (one index per country, not two).

country, and 19.6% of the sales in its industry. Indeed, Telecom Equipment accounted for 22.82% of the total sales of Finnish companies.

The country-Herfindahl index for Finland is 12.28. This is not dramatically higher than the median of 11.02 for all the countries in the sample. The industry-Herfindahl index for Finland is 8.29 (compared to a median 7.11 for the whole sample). This means that, even though the telecom industry is highly concentrated, the other industries are not. In contrast, Norway, has a country-Herfindahl measure of 73, and an industry-Herfindahl measure of 17.82. In this case it is driven by the natural resources industries that represent the bulk of the industrial production in Norway. For the U.S., the country-Herfindahl measure is 4.45 in 2001, and the industry-Herfindahl measure is 2.25%. Thus, Norway has a low cross-sectional dispersion in firm returns due to its industrial structure, not necessarily because of relative market efficiency, and the Herfindahl indices appear to be a useful control.

Liquidity also determines the ability to short a stock. Because obtaining measures of liquidity for emerging markets is difficult we use the simple method described in Bekaert, Harvey and Lundblad (2003) that measure liquidity as the percentage of returns in a country that are zero. We then compute the frequency of zero returns for each group of stocks (domestic and ADR) within each country, and for each year.

In our analysis, we replicate as closely as possible the estimation and control variables used in MYY, adding a short-sales indicator variable. We construct indices of industry concentration (by industry and country, as described in their paper), indices of earnings co-movement,<sup>14</sup> and calculate the number of listed firms in each country and year. The short-sales indicator is a dummy variable that equals one whenever short selling is allowed and practiced in a given country and year, and zero otherwise. If a country changed its regulation in a given

year, we eliminate that observation from the sample. We additionally construct two ADR dummies. ADR1 equals 1 if the observation corresponds to ADR stocks in countries where short sales are allowed and practiced, zero otherwise. ADR2 equals 1 if the observation corresponds to ADR stocks in countries where short sales are not allowed / not practiced. Our final panel with complete data includes 630 observations. The earnings co-movement index is available for only a subset of countries. When we use it the number of observations is reduced to 375. We estimate the model with year-fixed effects and country-fixed effects when possible. We control for several country-and-year specific factors, such as the GDP per capita, the country and industry Herfindahl indices, and the earnings co-movement index. We additionally control for time-invariant variables, like the geographical size of the country, the variance in GDP growth, and the good government index. In these cases, we estimate the regressions with country-random effects. As in MYY, the dependent variable is transformed into a continuous variable over the range  $[-\infty, +\infty]$ . We report the results of the estimation in Table 4.

[Insert Table 4 here]

### *b. Results*

The first panel in Table 4 confirms the MYY finding that countries with higher GDP per capita display lower stock price synchronicity. A one standard deviation in GDP per capita (in logs) is associated with a reduction of 0.91 standard deviations in the co-movement measure. However, the GDP per capita becomes insignificant without controlling for the liquidity of the market, the number of stocks, and Herfindahl indices. Moreover, the good government index is associated with lower co-movement. However, the coefficient is insignificant (second panel).

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<sup>14</sup> Since we replicate the procedure in MYY, we do not provide details on how these variables are computed.

We suspect these differences with MYY are due to the larger cross-section of countries we use in our analysis, but they could also be due to the fact that there have been secular changes in the residual risk component in different countries. In recent years, Campbell, Lettau, Malkiel and Xu (2001) for example, note a dramatic downward shift in residual risk for the U.S. If other countries experienced similar trends in residual risk, then the cross-sectional correlation to other variables could certainly change.

In all specifications but the last one, in which we control for earnings co-movement and hence we have fewer observations, we find that lifting short-sales restrictions is associated with an increase in the idiosyncratic portion of stock returns. This result is evidently not driven by country differences. That is, the description of legal regimes in Section III shows that, in general, more developed markets allow short selling while developing markets restrict it. However, the short-selling indicator remains significant when we allow for both year- and country-fixed effects. This is possible because we have inter-temporal changes in short-sales practices for some countries in our sample. In addition, we have cross-sectional variation within each country and year because, for the countries where short sales are not allowed / not practiced, we have a subsample of stocks in each year that is shortable (ADR stocks). Moreover, the short-sales indicator is significant after controlling for differences in the GDP per capita across countries, and the number of listed firms.

In terms of economic significance, short-selling restrictions are associated with an increase in market co-movement of 0.36 standard deviations (first panel). With respect with ADR stocks, non-shortable stocks in countries where short sales are prohibited / not practiced co-move 0.78 standard deviations more. This is both due to short-selling restrictions, as well as to the dual listing itself. Foerster and Karolyi (1999) have shown that dual stocks co-move more with the foreign market, and that the beta with respect to the domestic market decreases relative

to the pre-listing period. We find that more liquid markets tend to co-move more. This counterintuitive result is consistent with Dimson and Marsh (1983) who show that betas for illiquid stocks are underestimated when lagged relationships are not accounted for.

Tests for differences in the coefficients of ADR0 and ADR1 fail to reject the null that co-movement in dually-listed stocks is different depending on whether short sales are practiced or not. However, there is no clear evidence on whether co-movement tends to be larger in countries where short sales are prohibited / not practiced, or the opposite. In the first two regressions in Table 4, ADR1 is not significantly different from zero, which suggests that the effect of short sales on dually listed stocks is economically important. However, we get the opposite result when we estimate our model with random-country effects.

We perform a similar analysis with the  $R^2$ s of the regressions of stock returns on market indices. These results are reported in Table 5. Following MYY, we have transformed the  $R^2$ s to map them to the set of real numbers. The short-sales indicator is negative in all specifications, and the coefficient is significant in the second and third panels. Using  $R^2$ s, the GDP per capita becomes insignificant once we include the short-sales indicator. The good government index has a negative and significant sign, consistent with MYY: a one standard deviation increase in the quality of government index is associated to a reduction in co-movement of 0.52 standard deviations. When the earnings co-movement index enters the last regression in the bottom panel in Table 5 both the government index and the GDP per capita become insignificant.

[Insert Table 5 here]

In economic terms, a coefficient of  $-0.317$  for the short selling short sales indicator (panel 2) means that lifting short-selling restrictions reduces the average R-squared of individual stock returns by 0.17 standard deviations. In other words, the idiosyncratic risk of the average stock

increases by 0.17 standard deviations. Similarly, dual listing is associated to increases in R-squared of 0.50 and 0.57 standard deviations in countries where short sales are prohibited and allowed, respectively. Foerster and Karolyi (1999) find that the beta of dual stocks with respect to the world market portfolio increases following the dual listing, which is consistent with a reduction in market segmentation. Our results support this view. Furthermore, we fail to reject the hypothesis that dually listed stocks behave differently in countries where short sales are not practiced vs. countries where short sales are practiced (p-value for the difference is 0.0065).

As we show, our findings are robust to country differences, different time periods, and institutional differences. An economic rationale for our findings is provided by Campbell et al. (2001), who observe that the proportion of idiosyncratic risk in the U.S. has increased significantly in recent years. Despite the analyst scandals characterizing the post-Enron U.S. market, they suggest the trend towards more residual risk may result from the increasing availability of value-relevant firm-specific information which may in turn be impounded into stock prices in a liquid market.

## **VI. Short-Sales Restrictions and the Distribution of Stock Returns**

In this section we examine the distribution of stock returns conditional upon short-sales restrictions. We compute statistics for three different series' for each country and group. First we construct weekly stock returns for each firm in our sample with at least 100 daily observations available in a given year. We also construct time series' of weekly returns for the corresponding market indices. Finally, we run, for every year and each firm, regressions specified in equation (3), and save the residuals from the regression as abnormal firm returns. In a market with many systematic shocks, firms' raw returns may primarily reflect systematic shocks and thus the residual may be of interest. Because equity returns are distributed

approximately log-normal, we transform the three groups of returns into their logarithmic representation, and compute the skewness, standard deviation, and frequency of extreme returns.

We find weak evidence that supports regulators' view that short-selling constraints help prevent financial panics, at least for market returns. There is a negative relationship between market skewness and the ability to short. However this result is statistically significant only in one specification. The distribution of individual stock returns in our sample is also more negatively skewed when short-selling is allowed. There is also a significantly lower chance of a negative extreme return when short-selling is prohibited. However both results are not statistically significant.

#### *A. Skewness*

Hong and Stein (2002) develop a model in which investors possess different information about the value of a stock. Investors with negative information cannot always use it due to short-sale constraints. They would be willing to sell the stock to high-valuation investors, but they do not necessarily own it. The Hong and Stein model provides a rationale for why stock returns display negative skewness. Their paper predicts that elevated trading volume should be associated with increased negative skewness. Indeed, in the accompanying empirical study, Chen et al. (2002) test the proposition that abnormal turnover is a predictor of negative skewness. They find consistent evidence on a sample of NYSE and AMEX stocks for the period July, 1962 to December, 1998: at the firm level, changes in turnover predict future negative skewness.

A reasonable implication of the Hong and Stein model is that whenever short-selling restrictions are removed, skewness should become *less* negative. Our objective in this section is to test this proposition. Given that skewness is almost certainly affected by country- and

time-specific effects, we perform a cross-sectional analysis that controls for these factors. In addition to the country-specific controls, we follow Chen et al. (2001), who find that the de-trended turnover and past market returns are predictors of skewness. We construct the average de-trended turnover for the countries in our sample as follows. We first calculate the de-trended volume by firm, by subtracting the previous-year volume from the current volume.<sup>15</sup> We then calculate the sum of de-trended volumes for all firms in a given country, group of stocks, and year, and divide by the total number of shares outstanding for all the firms in the country-group with available data on volume.<sup>16</sup>

Results from the estimation are in Table 6. We find that short-sales restrictions are associated with negative skewness at the market level. However this coefficient is significant only in one specification.<sup>17</sup> Economically, allowing short-sales increases negative skewness by 0.87 standard deviations. We also find that, without controlling for short-sales restrictions, less developed countries, i.e. those with lower GDP per capita, have more positively skewed returns.

[Insert Table 6 here]

Moreover, for markets in which short selling is either prohibited or not practiced, there is no evidence that returns display significantly less negative skewness at the individual stock level. However, at the market level, where the welfare effects are greatest and where regulators expect short-sales to reduce crashes, it makes some difference whether short sales are allowed and practiced, once we control for macroeconomic factors.

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<sup>15</sup> Note that we lose one year of observations for every firm.

<sup>16</sup> We try an alternative specification that consists of calculating the market turnover first, and then de-trending it. This methodology, similar to Chen et al. (2001), provides qualitatively similar results.

<sup>17</sup> The short sales dummy is significant at the 5 percent level if we estimate the first regression in the table with country-random effects, rather than country-fixed effects. We however put more confidence in the more natural fixed-effect estimator.

In addition to these results we do not find evidence consistent with the theoretical model in Hong and Stein (2002) in that differences of opinion, proxied by the lagged de-trended turnover, predict more negative skewness. In the last fourth panels in Table 6 we regress the three different measures of skewness on our controls, only for the countries where short sales are not allowed / not practiced. Although the coefficient of the de-trended turnover is negative (indicating that de-trended turnover predicts market skewness), it is not significant. Only for individual stocks we find that lagged market returns help predict skewness. However, the coefficient is the opposite of what Hong and Stein (2002) predict.

### *B. Volatility of Returns*

One striking difference across countries is the volatility of individual stock returns. We report the unconditional standard deviation of individual stock returns in Table 3. We find evidence that the ability to take short positions is associated with less volatile stock markets. Within the group of domestic stocks, the median standard deviation of individual stock returns drops from 5.31 percent for short-sales constrained markets to 4.22 percent for markets that allow short sales. This difference is significantly different from zero (CHECK). However there is no difference in standard deviation between ADR and domestic stocks in countries where short sales are not practiced.

[Insert Table 7 here]

We confirm these results in the cross-section by regressing the standard deviation of returns (in logarithms) on country- and time-specific variables. The results of the regression are reported in Table 7. The coefficient for the short-sales indicator is always insignificant. Returns are more volatile in less developed countries, but the significance of the result disappears once we control for the good government index. In that regard, better-governed countries display

lower return volatility. Returns are also less volatile in countries with less volatile fundamentals—measured by the variance in GDP growth and the earnings co-movement index. In general, our analysis of the cross-sectional differences in the volatility of returns conditional upon short-selling restrictions should be considered in light of the potential that any association uncovered between the two might be driven by reverse causality. Riskier markets in general are more likely to pose concerns for regulators whose goals presumably include investor protection.

### *C. Crashes*

#### *C.1. Sample of All Countries*

Arguably the most important rationale for short-sales restrictions is that short selling is responsible for recent market crashes in the world financial market—particularly the 1987 market crash and the 1997 Asian crisis. Our objective in this section is to evaluate the empirical evidence for such a view.

The main difficulty in estimating the probability and severity of a market crash conditional upon the existence of short-sales restrictions is the *Peso problem*: we only have data on realized crashes. One alternative is to measure the extent of market drops during crisis events depending upon the existence of short-selling restrictions. However, this would not answer the question of whether crashes are more likely in the presence of short-sellers. If we believe market regulators, short selling may not trigger a crash, but simply make it more severe.

We therefore calculate the number of days in our sample period in which stock returns are below two standard deviations from their previous year average. We divide this number by the total number of trading days, and then compute the frequency of extreme returns. Under the assumption that returns are log-normally distributed, the percentage should equal 2.5 percent.

[Insert Table 8 here]

In Table 8 we regress the frequency of extreme results on a set of explanatory variables. Short-sales restrictions are insignificantly associated with more frequent extreme negative returns. The evidence from this table suggests that the probability of extreme negative returns is not likely to be a function of short-sales practices in countries, but rather determined by other non-specified, country-specific factors.

### *C.2. Countries with Regulatory Changes*

To shed some light on the relationship between short-sales constraints and extreme returns, and in order to eliminate a number of the potential cross-sectional differences that might explain the results thus far, we restrict our attention to the sub-set of countries that changed regulations over the period 1990–2001. Essentially this should allow a good hedonic control, country by country, at least under the assumption that the regulatory change is not triggered by shifts in other characteristics. These countries are Hong Kong, Norway, Sweden, Malaysia, and Thailand. In the case of Hong Kong, Norway, Sweden, and Thailand, short-selling restrictions were removed in a specific year (not the same calendar year for each country). In Malaysia—as we detail in section III—short selling was allowed only for the period 1995–1997, and was then prohibited again in 1997 at the onset of the Asian financial crises.

[Insert Table 9 here]

Table 9 reports the frequency of extreme events and the market skewness for the five countries, around the year in which short sales become effective. We further classify stocks into ADR and domestic. We calculate the average by year-to-event,<sup>18</sup> and find that, on average, the

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<sup>18</sup> Malaysia is not included in years after t+2, because short sales were prohibited again in 1997.

frequency of extreme returns drops from 8.94 percent in the pre-regulation period to 5.57 percent one year after restrictions are lifted. In some years, however, extreme returns are too frequent (7.16 percent year t+5, 6.57 percent in year t+6). In Sweden, the frequency of extreme results is lower after 1991 than in 1990, one year before the lifting of short-selling restrictions. Also in Thailand the effect of short sales is a reduction of the percentage of extreme returns, compared to the pre-1997 period. It therefore seems that the effect of short sales on crashes may be somewhat country-specific, and if anything, there is a reduction in the frequency of negative extreme returns once short-sales are allowed. This result contradicts the regulators' conjecture that short sales induce crashes.

Cross-sectional regression results using yearly information for the aforementioned five countries (not reported here) provide similar results. In general there is no time-series association between short sales restrictions and the frequency of negative extreme returns.

#### *D. Kernel Estimation of Return Distributions*

Thus far, we have looked at various statistics of conditional distributions. It is instructive, however, to look at the return densities themselves. We perform a kernel estimation of a density function of stock returns with and without short-sales constraints that fits the distribution of returns.<sup>19</sup> The advantage of the kernel estimation is that we do not need to constrain the distribution to be normal, or even symmetric.

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<sup>19</sup> The general form of the kernel density estimator is:

$$\hat{f}_\lambda(x) = \frac{1}{n_\lambda} \sum_{i=1}^n N\left(\frac{x-x_i}{\lambda}\right)$$

[Insert Figure 2 here]

We estimate the kernel density for the market returns, both for the total sample and for the sub-sample of countries with regulatory changes, depending on whether short sales are allowed or not, and depending on whether stocks are dually listed or not. Figure 2 plots the histograms of returns, as well as the densities, depending on the existence of short-selling restrictions. Confirming the results in Table 3, Figure 2 shows that (i) the distribution of returns is more leptokurtotic when short sales are allowed and practiced.; and (ii) the distribution of returns is not symmetric. Focusing on the subsample of domestic stocks, there is an apparent difference in skewness between stocks in countries where short sales are allowed and practiced, and countries where short sales are prohibited, at least in countries where regulation has changed in the period 1990-2001. As shown in Section VI.A, these differences disappear once we control for country-specific variables.

## Conclusions

Restrictions on short selling of shares are nearly as old as stock markets themselves. Critics often view short-sales as immoral—the exploitation of others’ misfortune and an exacerbating factor in periods of market crisis. As recently as the Asian currency crisis of 1997,

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where  $N(\cdot)$  is the kernel function, that we specify to be standard normal,  $\lambda$  is the bandwidth parameter,  $n$  is the sample size, and  $x_i$  is the  $i$ th observation. The kernel density minimizes the mean integrated squared error  $\eta_\lambda$ :

$$\eta_\lambda = \int_x \left\{ E(\hat{f}_\lambda(x) - f(x))^2 \right\} dx + \int_x \text{Var}(\hat{f}_\lambda(x)) dx$$

where  $\lambda$  is the one that minimizes the estimated mean integrated square error:

$$\hat{\eta}_\lambda = \frac{1}{4} \lambda^4 \left( \int_t t^2 N(t) dt \right)^2 \int_x (f''(x))^2 dx + \frac{1}{n \lambda^5} \int_t (N(t))^2 dt$$

short-sellers were blamed by politicians and journalists for helping to destroy the “Asian Miracle.” In the current environment with the growth of hedge funds, concerns about the danger of allowing speculation frequently surface. There is at least some common suspicion that short selling can exacerbate market crashes. Most academic researchers, however, make a strong theoretical case for allowing short-sales in markets. Their case is based upon the notion that markets exist to facilitate the efficient pricing of assets, and that restricting short-sales reduces market efficiency. Recent empirical evidence by researchers, particularly Jones and Lamont (2001) provides some support for the hypothesis that difficulty in short selling is associated with security mispricing. In this paper, we survey short-selling regulations and practices for major stock markets around the world. We find empirical evidence in support of both views. We use a sample of countries with time-series as well as cross-sectional differences in short sales practice. Within countries where short sales are not allowed / not practiced, we additionally consider the subsample of stocks that list in either the U.S. or the U.K., and which are therefore shortable. Using a market efficiency measure developed by Mørck et al (2000), we find a negative association between short-sales restrictions and the diffusion of value-relevant information into prices. Our analysis of the statistical characteristics of markets, specifically the standard deviation and skewness of log returns, suggests that short-sales restrictions are more common in high-volatility countries, but that the restrictions are also weakly associated with less negative skewness in individual stock returns.

## References

Aitken, Michael, Alex, Frino, Michael S. McCorry, and Peter L. Swan, 1998, "Short Sales Are Almost Instantaneously Bad News: Evidence from the Australian Stock Exchange," *Journal of Finance*, 2205-2223

Allen, Franklin, and Douglas Gale, 1991, "Arbitrage, Short Sales, and Financial Innovation," 1991, *Econometrica* 59(4), 1041-1068

Bekaert, Geert, and Campbell R. Harvey, 2000, "Foreign Speculators and Emerging Equity Markets," *Journal of Finance*, 565-613

Bekaert, Geert, Campbell R. Harvey, and Christian Lundblad, 2003, "Liquidity and Expected Returns: Lessons from Emerging Markets," working paper.

Bernardo, Antonio, and Ivo Welch, 2004, "Liquidity and Financial Market Runs," *The Quarterly Journal of Economics* 119, forthcoming.

Biais, Bruno, Christophe Bisiere, and Jean-Paul Decamps, 1999, "Short-sales constraints, Liquidity and Price Discovery: An Empirical Analysis on the Paris Bourse," *European Financial Management* 5(3), 395-409

Bris, Arturo, William N. Goetzmann, and Ning Zhu 2004, "Short Sales in Global Perspective," in Frank Fabozzi, ed., *The Theory and Practice of Short-Selling*, Wiley, forthcoming.

Campbell, John Y., Martin Lettau, Burton G. Malkiel and Yexiao Xu , 2001, "Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk," *Journal of Finance* 56(1), 1-43

Chen, Joseph, Harrison Hong, and Jeremy Stein, 2001, "Forecasting Crashes: Trading Volume, Past Returns, and Conditional Skewness in Stock Prices," *Journal of Financial Economics* 61(3), 345-381.

Chen, Zhiwu, 1995, "Financial Innovation and Arbitrage Pricing in Frictional Economies," *Journal of Economic Theory*, 65(1), February, 117-135.

Chen, Zhiwu, 2001, "Viable Costs and Equilibrium Prices in Frictional Securities Markets," *Annals o Economics and Finance*, 2(2), 297-323.

D'Avolio, Gene, 2002, "The Market for Borrowing Stock," *Journal of Financial Economics*, 66(2), pages 271-306.

De Marchi, Neil and Paul Harrison, 1994, "'Trading in the Wind' with Guile: The Troublesome Matter of the Short Selling of Shares in Seventeenth Century Holland," *History of Political Economy Supplement*, 26(0), pages 47-65.

Diamond, Douglas, and Robert Verrecchia, 1987, "Constraints on Short-selling and Asset Price Adjustment to Private Information," *Journal of Financial Economics* 18(2) June, 277-311

Dillen, J.G. van, 1930, "Isaac Le Maire en de Handle in Action der Oost-Indische Companie," *Economisch-historisch Jaarboek*.

Dimson, Elroy, and Paul Marsh, 1983, "The Stability of U.K. Risk Measures and the Problem of Thin Trading," *Journal of Finance* 38, 753-783.

Duffie, Darrell, Nicolae Garleanu, and Lasse Heje Pedersen, 2002, "Securities Lending, Shorting and Pricing," *Journal of Financial Economics* 66(2), pages 307-339.

Erzo G. J. Luttmmer, 1996, "Assessing Specification Errors in Stochastic Discount Factor Models," *Econometrica* 64(6), 1439-1467.

Foerster and Karolyi, 1999, "The Effects of Market Segmentation and Investor Recognition on Asset Prices: Evidence from Foreign Stocks Listing in the U.S.," *Journal of Finance* 54, 981-1014.

Geczy, Christopher C., David K. Musto, and Adam V. Reed, 2002, "Stocks Are Special Too: An Analysis of the Equity Lending Market," *Journal of Financial Economics* 66, 241-269.

Harvey, Campbell R., and Akhtar Siddique, 1999, "Autoregressive Conditional Skewness," *Journal of Financial and Quantitative Analysis* 34, 465-487

Harvey, Campbell R., and Akhtar Siddique, 2000a, "Conditional Skewness in Asset Pricing Tests," *Journal of Finance* 55, 1263-1295

Harvey, Campbell R., and Akhtar Siddique, 2000b, "Time—Varying Conditional Skewness and the Market Risk Premium," *Research in Banking and Finance* 1, 27-60

He, Hua, and David Modest, 1995, "Market Frictions and Consumption-based Asset Pricing," *Journal of Political Economy*, 103(1), 94-117.

Hong, Harrison and Jeremy Stein, 2002, "Differences of Opinion, Short-sales Constraints and Market Crashes," forthcoming *Review of Financial Studies*.

International Securities Services Association Handbook, 2002.

Jegadeesh Naramsimhan and Sheridan Titman, 1995, "Overreaction, Delayed Reaction and Contrarian Profits," *Review of Financial Studies* 8, 973-993.

Jouini, E and H, Kallal 2001, "Efficient Trading Strategies in the Presence of Market Frictions," *Review of Financial Studies* 14(2), 343-369

Jones, Charles and Owen Lamont, 2002, "Short Sale Constraints and Stock Returns," *Journal of Financial Economics*, 66(2), 207-239.

La Porta R., Lopez-de-Silanes, Shleifer, A., Vishny, R.W., 1997, "Law and Finance," *Journal of Political Economy* 106, 1112-1155.

Lars Peter Hansen and Ravi Jagannathan, 1997, "Assessing Specification Errors in Stochastic Discount Factor Model," *Journal of Finance*, 52(2) June, 557-590.

Li, Lianfa, and Belton M. Fleisher, 2002, "Heterogeneous Expectations and Stock Prices in Segmented Markets: Application to Chinese Firms," working paper, Ohio State University.

Montias, John Michael, 1989, *Vermeer and His Milieu*, Princeton Press, Princeton, NJ.

Mørck, Randall, Bernard Yeung, and Wayne Yu, 2000, "The Information Content of Stock Markets: Why do Emerging Markets Have Synchronous Stock Price Movement," *Journal of Financial Economics*, 58(1), pages 215-260.

Ofek, Eli, and Matthew Richardson, 2002, "DotCom Mania: The Rise and Fall of Internet Stock Prices," *Journal of Finance*, forthcoming.

Poitras, Geoffrey, 2002, "Short Sales Restrictions, Dilution and the Pricing of Rights Issues on the Singapore Stock Exchange," *Pacific Basin Finance Journal* 10(2), 141-62.

Ross, Stephen A., 1976, "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory* 13, 341-360.

Untermeyer, Samuel, 1915, "Speculation on Stock Exchanges and Public Regulations of the Exchanges," *American Economic Review* 5(1), 24-68.

World Directory of Securities Lending and Repo, *International Securities Finance Magazine*.

Country	When was short selling allowed	When was securities lending allowed	Whether Short Selling is Practiced	Comments
Argentina	1999	1991	No	Equity lending is rare and occurs only between brokers. Short-selling cannot last more than 360 days in a row. Only allowed for 16 stocks.
Australia	Before 1990	Before 1990	Yes	Securities can be borrowed from ASX and counter party. Cash and non-cash collateral are accepted at 105-110% of the underlying value of the loan securities. Collateral is marked-to-market daily.
Austria	Before 1990	Before 1990	Yes	
Belgium	Before 1990	Before 1990	Yes	There is no organized market for stock lending and borrowing. A law on securities lending was passed in March 1999 but still pending. There is no official regulation on short selling stocks.
Brazil	Before 1990	Before 1990	No	CBLC has been authorized to maintain a securities lending program. Under CVM Instruction No. 249, only entities which offer settlement, registration, and custody services in the Brazilian market are authorized to provide securities lending services. Accordingly, foreign investors are not authorized to engage in directed/discretionary lending activities that are outside the CBLC program.
Canada	Before 1990	Before 1990	Yes	The market for securities lending is large (40+ billion dollar business) and well developed.
Chile	Allowed in 1999	Allowed in 1999	No	Short-selling cannot last more than 360 days in a row. The entity (including individuals) who is lending the stocks maintains the beneficial ownership, except the right to vote.
Colombia	Not allowed	Not allowed	No	Securities lending is not authorized.
Czech Republic	Before 1990	Before 1990	Yes	There is no regulations on short selling since Prague Stock Exchange (PSE) was opened in 1993. IT is possible to sell securities only if absent securities are bought or borrowed before the settlement date.
Denmark	Before 1990	Before 1990	Yes	No regulatory barriers inhibiting securities lending.
Finland	Allowed in 1998	Before 1990	No	The transfer tax laws place a serious burden on the activity.
France	Before 1990	Before 1990	Yes	Securities lending is permitted by law in 1987 and 1988. All establishments (domestic and foreign) are eligible for short-selling as long as they are recognized as counter parties.
Germany	Before 1990	Before 1990	Yes	A securities lending facility was created in 1989 to improve market liquidity.
Greece	Not allowed	Not allowed	No	Securities lending and borrowing have been legalized by the Greek Parliament but the operational framework has yet to be established.
Hong Kong	Allowed in 1996	Before 1990	Yes	Short selling is allowed for 33 stocks in 1994, and then to a wide range of stocks in 1996.
India	Before 1990	Before 1990	No	Not popular among market players. Not allowed for foreign investors.
Indonesia	Not allowed	Allowed in 1996	No	No guidelines have been provided by BAPEPAM, The Indonesian Regulatory Authority for the Indonesian Capital Market.
Ireland	Before 1990	Before 1990	Yes	Securities lending volume is still limited.
Israel	Before 1990	Before 1990	No	The TASE does not offer a securities lending program to its members. TASE rules indicate that the securities account of a TASE member at clearing house may not enter into a short position intentionally.
Italy	Before 1990	Before 1990	Yes	
Japan	Before 1990	Before 1990	Yes	Allowed for stocks listed on the first section of the exchanges.
Jordan	Not allowed	Not allowed	No	
Luxembourg	Before 1990	Before 1990	Yes	
Malaysia	Allowed in 1995, Prohibited again in 1997	Allowed in 1995, Prohibited again in 1997	Yes	Short selling and securities lending were suspended during the regional financial crisis of 1997. With the economic recovery, improvements in reporting requirements, prudential controls and the cessation of trading of KLSE-listed securities offshore, short selling and securities lending are expected to be restored.
Mexico	Before 1990	Before 1990	Yes	The system is generally used as a safeguard against failing to deliver rather than securities lending as a product. Foreign investors are eligible to participate in securities lending through a local broker. Margin is 150%.
Netherlands	Before 1990	Before 1990	Yes	There is a central lending facility at the ASE.

New Zealand	Allowed in 1992	Not allowed	No	Tax regulations prevents onshore securities lending from taking off.
Norway	Allowed in 1992	Allowed in 1996	Yes	Securities lending is still in the early stages of development and tax implications are being discussed at the Ministry of Finance.
Pakistan	Not allowed	Not allowed	No	There are no regulations that restrict foreign investors from lending or borrowing securities. Short selling is not allowed.
Peru	Not allowed	Not allowed	No	Off shore lending is prohibited. Lima Stock Exchange is considering allowing new activities such as securities lending, short selling and new repo trades in the future.
Philippines	Allowed in 1998	Allowed in 1998	No	Although the SEC has approved the rules on SBL and short selling, the rules are not yet clearly defined in the market.
Poland	Allowed in 2000	Before 1990	No	Neither the full legal nor operational framework have been established.
Portugal	Before 1990	Before 1990	Yes	Securities lending is allowed and practiced. BVLP charges 10 b.p. annualized over the initial value (maximum days for calculation is 45 ) for this service.
Singapore	Not allowed	Before 1990	Yes	Onshore lending is limited while offshore lending is active.
Slovak Republic	Not allowed	Not allowed	No	Securities lending and borrowing is not allowed under the Securities Act.
South Africa	Before 1990	Before 1990	Yes	Short selling is always allowed in JSE.
South Korea	Not allowed	Before 1990	No	Securities lending and borrowing has not been active to date.
Spain	Allowed in 1992	Allowed in 1992	No	Securities lending and short selling is available since 1992. Since July 1994, SCLV has acted as principal for the lending pool formed by the daily bids from the clearing members. The load must be reported to the SCLV within two working days of the sale date.
Sweden	Allowed in 1991	Allowed in 1991	Yes	Widely practiced.
Switzerland	Before 1990	Before 1990	Yes	Securities lending is legal in Switzerland and there are no restrictions on who may borrow or lend. There is no central lending facility and no stamp duties apply to securities lending.
Taiwan	Not allowed	Not allowed	No	Foreign investors are prohibited from borrowing securities on-shore and can only lend securities on-shore to brokers to cover their fails.
Thailand	Allowed in 1997	Allowed in 1999	Yes	Short selling is very limited after being allowed in 1999.
Turkey	Before 1990	Allowed in 1996	No	Securities lending is not widely practiced.
United Kingdom	Before 1990	Before 1990	Yes	Short selling is active in UK.
United States	Before 1990	Before 1990	Yes	
Venezuela	Not allowed	Not allowed	No	Securities lending is not specifically prohibited or provided for under current regulations. Free transfers of securities between different beneficial owners cannot be done without executing a trade on the exchange. Off-shore lending is generally not practiced.
Zimbabwe	Not allowed	Not allowed	No	

**Table 1. Short Selling Restrictions Around the World**

For each country in the sample, the table describes the date where short selling was allowed if this happened on or after 1990. Otherwise countries are classified as 'Allowed Before 1990', or 'Not Allowed'. Securities Lending refers to the ability of an investor to borrow securities from another party. Short Selling refers to the ability of an investor to sell a borrowed security to a third party. Short Selling is practiced when there are indications from market participants, market regulators, or institutions within a country, that short selling is a common practice. Data is obtained from the Global Network Management Division at Morgan Stanley Dean Witter, the International Securities Lending at Goldman Sachs, the corresponding market regulators, the International Securities Services Association Handbook, and practitioners listed in the *Worldwide Directory of Securities Lending and Repo*.

		1990-1993	1994-1998	1999-2001
<b>All Countries</b>	<b>Shortable</b>	<b>\$1,859,087</b>	<b>\$9,953,598</b>	<b>\$20,133,808</b>
	<b>Non-Shortable</b>	<b>\$4,517,821</b>	<b>\$30,167,797</b>	<b>\$36,020,697</b>
	<b>Ratio</b>	<b>29.15%</b>	<b>24.81%</b>	<b>35.85%</b>
Argentina	Shortable	\$8,102	\$1,024,311	\$621,145
	Non-Shortable	\$229,947	\$1,546,307	\$611,881
	Ratio	3.40%	39.85%	50.38%
Brazil	Shortable	NA	\$23,855	\$412,170
	Non-Shortable	NA	\$1,686,104	\$5,652,398
	Ratio		1.40%	6.80%
Chile	Shortable	NA	\$83,031	\$8,922
	Non-Shortable	NA	\$35,761	\$371
	Ratio		69.90%	96.01%
Colombia	Shortable	NA	\$142,199	\$5,821
	Non-Shortable	NA	\$682,718	\$207,870
	Ratio		17.24%	2.72%
Finland	Shortable	\$2,531	\$822,144	\$5,712,227
	Non-Shortable	\$535,100	\$2,245,906	\$2,414,693
	Ratio	0.47%	26.80%	70.29%
Greece	Shortable	NA	\$13,615	\$513,479
	Non-Shortable	NA	\$489,461	\$2,384,434
	Ratio		2.71%	17.72%
India	Shortable	NA	\$437,688	\$245,704
	Non-Shortable	NA	\$1,904,905	\$713,632
	Ratio		18.68%	25.61%
Indonesia	Shortable	NA	NA	\$666,602
	Non-Shortable	NA	NA	\$3,164,651
	Ratio			17.40%
Israel	Shortable	\$21,097	\$247,327	\$341,939
	Non-Shortable	\$189,225	\$915,396	\$1,021,634
	Ratio	10.03%	21.27%	25.08%
New Zealand	Shortable	\$101,763	\$468,082	\$215,881
	Non-Shortable	\$204,975	\$1,125,216	\$601,862
	Ratio	33.18%	29.38%	26.40%
Norway	Shortable	\$269,854	\$203,628	NA
	Non-Shortable	\$441,251	\$399,236	NA
	Ratio	37.95%	33.78%	
Peru	Shortable	NA	\$41,134	\$23,732
	Non-Shortable	NA	\$297,433	\$203,072
	Ratio		12.15%	10.46%
Philippines	Shortable	NA	\$188,073	\$97,366
	Non-Shortable	NA	\$2,307,005	\$841,460
	Ratio		7.54%	10.37%
Poland	Shortable	NA	\$9,845	\$342,428
	Non-Shortable	NA	\$86,116	\$506,429
	Ratio		10.26%	40.34%
South Korea	Shortable	NA	\$2,093,501	\$3,294,570
	Non-Shortable	NA	\$3,130,015	\$2,716,942
	Ratio		40.08%	54.80%
Spain	Shortable	\$1,455,740	\$3,756,426	\$5,624,076
	Non-Shortable	\$2,917,323	\$6,652,798	\$6,463,345
	Ratio	33.29%	36.09%	46.53%
Taiwan	Shortable	NA	\$390,150	\$1,993,812
	Non-Shortable	NA	\$6,003,072	\$6,632,702
	Ratio		6.10%	23.11%
Turkey	Shortable	-	8590.4	13931.49
	Non-Shortable	NA	\$660,347	\$1,883,324
	Ratio		1.28%	0.73%

**Table 2. World Market Capitalization and Short-Sales Restrictions. Countries where Short Sales are Not Allowed / Not Practiced**

This table classifies the World Market capitalization into shortable and non-shortable, for countries where short sales are not allowed / not practiced. To calculate the numbers in these columns we have taken into account firms in countries where short sales are not allowed / not practiced, that list in markets where short sales are allowed and practiced, in particular the U.S. (NYSE and Nasdaq) and the U.K. (LSE).

processes, in particular the C.S. (1972 and 1980) and the C.R. (1977).

<b>Domestic Stocks</b>									
	Proportion of Stocks Moving Together	R-Squared	Standard Deviation of Individual Stock Returns	Frequency of Extreme Negative Returns	Market Skewness	Mean Skewness of Individual Stock Returns	Mean Skewness of Individual Residual Returns	Market Turnover (Detrended)	Market Return
<i>Short Sales Not Allowed / Not Practiced</i>									
Number of Observations	283	250	251	251	250	250	250	249	251
Mean	80.76%	0.54%	0.0541	8.72%	0.0706	0.0914	0.0377	0.0624	12.11%
Median	77.51%	0.15%	0.0531	6.28%	0.0966	0.0589	0.0275	-0.2008	10.17%
<i>Short Sales Allowed And Practiced</i>									
Number of Observations	301	281	281	281	281	281	281	277	281
Mean	74.38%	0.18%	0.0459	5.97%	-0.0407	0.0705	0.0499	0.1469	12.51%
Median	72.70%	0.04%	0.0422	4.81%	-0.0350	0.0737	0.0454	-0.0768	9.58%
Difference (p-value)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0238)	(0.4579)	(0.7207)	(0.2443)	(0.6466)
<i>Whole Sample</i>									
Number of Observations	584	531	532	532	531	531	531	526	532
Mean	77.47%	0.35%	0.0498	7.27%	0.0117	0.0803	0.0441	0.1069	12.32%
Median	74.86%	0.08%	0.0486	5.41%	0.0214	0.0709	0.0394	-0.1526	9.91%
<b>ADR Stocks</b>									
<i>Short Sales Not Allowed / Not Practiced</i>									
Number of Observations	177	146	147	147	146	146	146	140	147
Mean	88.39%	17.85%	0.0546	8.38%	0.0345	0.0423	-0.0294	-0.2419	8.64%
Median	86.81%	8.76%	0.0540	2.55%	0.0893	0.1068	-0.0040	-0.4204	5.30%
<i>Short Sales Allowed And Practiced</i>									
Number of Observations	248	240	240	228	240	228	228	197	240
Mean	81.02%	9.06%	0.0492	6.17%	-0.0322	-0.0029	0.0156	-0.1205	11.05%
Median	77.95%	4.16%	0.0470	2.68%	-0.0434	0.0216	0.0078	-0.3942	11.40%
Difference (p-value)	(0.0000)	(0.0000)	(0.0025)	(0.2273)	(0.0058)	(0.0196)	(0.9890)	(0.1585)	(0.4321)
<i>Whole Sample</i>									
Number of Observations	425	386	387	375	386	374	374	337	387
Mean	84.09%	12.38%	0.0512	7.04%	-0.0070	0.0148	-0.0020	-0.1710	10.13%
Median	80.46%	5.70%	0.0493	2.68%	0.0118	0.0443	0.0038	-0.4047	8.34%
Short-Sales Not Allowed / Not Practiced: Difference ADR Stocks -Domestic Stocks	(0.0000)	(0.0000)	(0.9324)	(0.0000)	(0.6669)	(0.7633)	(0.6922)	(0.0000)	(0.5186)
Short-Sales Allowed and Practiced: Difference ADR Stocks -Domestic Stocks	(0.0000)	(0.0000)	(0.0046)	(0.6210)	(0.8757)	(0.0442)	(0.4604)	(0.0010)	(0.8226)
Whole Sample: Difference ADR stocks - Domestic stocks	(0.0000)	(0.0000)	(0.1536)	(0.0000)	(0.9490)	(0.2474)	(0.2474)	(0.0000)	(0.9051)
Whole Sample: Difference Short Sales Allowed-Prohibited	(0.0000)	(0.0000)	(0.0000)	(0.0050)	(0.0050)	(0.0259)	(0.8148)	(0.1755)	(0.4169)

**Table 3. Descriptive Statistics**

Mean and Median values of the variables used in the paper, classified by Domestic / ADR stocks, as well as by Short Sales Regulation. The sample includes firms from 47 countries with stock price information available from Datastream and CRSP. All variables are defined in the paper. Test of differences are based on non-parametric Wilcoxon tests for differences in medians. P-values are in parentheses

	Dependent Variable: Average Fraction of Stocks Moving Together									
	Mean	Std.Dev	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Short Sales Allowed and Practiced	0.598	0.491	-0.301 **	-2.03	-0.336 ***	-3.06	-0.194 *	-1.93	-0.155	-1.40
ADR0	0.057	0.232	-0.655 ***	-3.26	0.297 ***	2.97	-0.265	-1.62	-0.135	-0.50
ADR1	0.168	0.374	-1.354	-7.20	-0.029	-0.46	-0.883 ***	-5.71	-0.930 ***	-4.41
Log (Number of Firms)	4.605	1.674	-0.243 ***	-4.43			-0.117 ***	-2.80	-0.088 *	-1.64
Days with Zero Return (%)	-0.943	1.004	-0.318 ***	-7.78			-0.298 ***	-7.71	-0.340 ***	-6.37
Log (GDP per capita)	9.481	0.730	-1.047 ***	-3.48	-0.050	-0.29	-0.106	-0.67	-0.543 **	-2.09
Country Herfindahl Index	0.121	0.171	-1.131	-1.21			0.126	0.29	0.806 *	1.75
Industry Herfindahl Index	0.206	0.227	1.375	1.41			-0.109	-0.26	-0.477	-1.07
Good Government Index	24.199	4.601			-0.017	-0.62	0.003	0.14	0.078 **	1.99
Log (Country Size)	12.668	2.071					0.046	1.57	0.026	0.66
Earnings Comovement Index	0.330	1.007							0.112 *	1.67
Variance in GDP growth	0.001	0.001							13.851	0.20
Dependent Variable	-0.075	0.835								
Test ADR0=ADR1 (p-value)			(0.0000)		(0.0056)		(0.0000)		(0.0000)	
Number of Observations			630		617		588		375	
Within R-Square			0.66		0.61		0.65		0.73	
Between R-Square			0.17		0.22		0.28		0.19	
Overall R-Square			0.31		0.50		0.57		0.61	
Year Fixed Effect			Yes		Yes		Yes		Yes	
Country Fixed Effect			Yes		No		No		No	
Country Random Effect			No		Yes		Yes		Yes	

Table 4. Comovement of Stocks: Proportion of Stocks Moving Together

The dependent variable is the average R-squared of by-firm and year regressions of weekly stock returns on the market index. The number of firms is the number of firms with available stock price data in Datastream, in each country and year. Country Herfindahl index is calculated as the sum of the market shares (squared) of every firm in each country and year, relative to the corresponding country's total sales. Industry Herfindahl index is calculated as the sum of the market shares (squared) of every industry in each country and year, relative to the corresponding country's total sales. The size of the country is the extension of a country in square kilometers, from www.yahoo.com. The earnings comovement index is calculated as in Morck et al. (2000). The Good Government index is the sum of the Risk of Expropriation, Corruption, and Repudiation of Contract indices from La Porta et al. (1997). The Short Selling variable is a dummy variable that equals one when short selling is allowed and practiced in a given country and year, zero otherwise. ADR1 equals 1 if the observation corresponds to ADR stocks in countries where short sales are allowed and practiced, zero otherwise. ADR2 equals 1 if the observation corresponds to ADR stocks in countries where short sales are not allowed / not practiced. The sample includes firms from 47 countries with stock price information available from Datastream. Macroeconomic variables are from the Economist Intelligence Unit database. All regressions include year-fixed effects. Standard errors are White-heteroskedasticity consistent.

Dependent Variable: R-Square of Regression of Stock Returns on Market Indices										
	Mean	Std.Dev	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	
Short Sales Allowed and Practiced	0.598	0.491	-0.100	-0.87	-0.317	** -2.15	-0.166	** -1.97	-0.145	
ADR0	0.057	0.232	0.110	0.45	3.958	*** 2.06	0.120	0.64	0.346	
ADR1	0.168	0.374	0.252	1.23	4.525	*** 5.33	0.176	1.14	0.268	
Log (Number of Firms)	4.605	1.674	-1.060	*** -3.47			-1.061	*** -2.68	-1.050	***
Days with Zero Return (%)	-0.943	1.004	-0.213	*** -5.67			-0.248	*** -6.98	-0.219	***
Log (GDP per capita)	9.481	0.730	0.320	1.27	0.223	0.72	0.170	1.22	0.017	
Country Herfindahl Index	0.121	0.171	-0.620	-0.83			-0.156	-0.40	-0.273	
Industry Herfindahl Index	0.206	0.227	0.764	0.98			0.188	0.50	0.260	
Good Government Index	24.199	4.601			-0.204	*** -3.46	-0.066	** -2.95	-0.032	
Log (Country Size)	12.668	2.071					-0.044	* -1.68	-0.058	*
Earnings Comovement Index	0.330	1.007							-0.031	
Variance in GDP growth	0.001	0.001							76.531	
Dependent Variable	-6.963	1.813								
Test ADR0=ADR1 (p-value)			(0.3500)		(0.0065)		(0.7106)		(0.7324)	
Number of Observations			553		538		491		332	
Within R-Square			0.94		0.88		0.95		0.96	
Between R-Square			0.81		0.21		0.94		0.89	
Overall R-Square			0.87		0.50		0.94		0.95	
Year Fixed Effect			Yes		Yes		Yes		Yes	
Country Fixed Effect			Yes		No		No		No	
Country Random Effect			No		Yes		Yes		Yes	

Table 5. Comovement of Stocks: R-squared

The dependent variable is the average R-squared of by-firm and year regressions of weekly stock returns on the market index. The number of firms is the number of firms with available stock price data in Datastream, in each country and year. Country Herfindahl index is calculated as the sum of the market shares (squared) of every firm in each country and year, relative to the corresponding country's total sales. Industry Herfindahl index is calculated as the sum of the market shares (squared) of every industry in each country and year, relative to the corresponding country's total sales. The size of the country is the extension of a country in square kilometers, from [www.yahoo.com](http://www.yahoo.com). The earnings comovement index is calculated as in Morck et al. (2000). The Good Government index is the sum of the Risk of Expropriation, Corruption, and Repudiation of Contract indices from La Porta et al. (1997). The Short Selling variable is a dummy variable that equals one when short selling is allowed and practiced in a given country and year, zero otherwise. ADR1 equals 1 if the observation corresponds to ADR stocks in countries where short sales are allowed and practiced, zero otherwise. ADR2 equals 1 if the observation corresponds to ADR stocks in countries where short sales are not allowed / not practiced. The sample includes firms from 47 countries with stock price information available from Datastream. Macroeconomic variables are from the Economist Intelligence Unit database. All regressions include year-fixed effects. Standard errors are White-heteroskedasticity consistent.

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t-stat
-1.43
1.15
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Dependent Variable: Skewness of Market Indices										
	Mean	Std.Dev	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Short Sales Allowed and Practiced	0.598	0.491	0.184	0.86	-0.164 ***	-2.47	-0.031	-0.32		
ADR0	0.057	0.232	0.259	0.98	0.079	0.56	0.052	0.22	0.296	0.58
ADR1	0.168	0.374	0.402	1.55	0.210	1.56	0.065	0.33		
Log (Number of Firms)	4.605	1.674	0.028	0.4	0.004	0.14	0.002	0.03	0.002	0.01
Days with Zero Return (%)	-0.943	1.004	0.123	2.1	0.092 **	2.45	0.005	0.08	0.253 ***	2.71
Log (GDP per capita)	9.481	0.730	-1.044 ***	-2.43	0.050	0.62	0.082	0.59	-0.245	-0.38
Country Herfindahl Index	0.121	0.171	-0.986	-0.77	-0.379	-1.47	-0.375	-1.27	-1.144	-0.64
Industry Herfindahl Index	0.206	0.227	0.769	0.58	-0.006	-0.03	0.067	0.32	0.827	0.44
Detrended Turnover (Lagged)	-0.067	0.922	-0.016	-0.57	-0.014	-0.48	-0.025	-0.65	-0.027	-0.62
Market Return (Lagged)	0.110	0.330	-0.048	-0.58	-0.066	-0.81	-0.169	-1.41	0.125	1.08
Good Government Index	24.199	4.601			-0.012	-0.93	-0.024	-1.11		
Log (Country Size)	12.668	2.071			0.007	0.50	0.012	0.64		
Earnings Comovement Index	0.330	1.007					-0.014	-0.4		
Dependent Variable	-0.006	0.565								
Test ADR0=ADR1 (p-value)			(0.3419)		(0.2768)		(0.9477)		(0.5647)	
Number of Observations			528		496		323		225	
Within R-Square			0.1916		0.1621		0.173		0.2186	
Between R-Square			0.043		0.346		0.226		0.033	
Overall R-Square			0.032		0.180		0.179		0.137	
Year Fixed Effect			Yes		Yes		Yes		Yes	
Country Fixed Effect			Yes		No		No		Yes	
Country Random Effect			No		Yes		Yes		No	

Dependent Variable: Skewness of Individual Stock Abnormal Return										
	Mean	Std.Dev	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Short Sales Allowed and Practiced	0.598	0.491	0.079	0.65	0.022	0.57	0.064	1.3		
ADR0	0.057	0.232	-0.245	-1.63	0.035	0.43	0.040	0.33	-0.159	-0.58
ADR1	0.168	0.374	-0.182	-1.24	-0.030	-0.38	0.001	0.01		
Log (Number of Firms)	4.605	1.674	-0.051	-1.25	0.006	0.35	-0.006	-0.27	-0.031	-0.4
Days with Zero Return (%)	-0.943	1.004	-0.005	-0.15	-0.017	-0.77	0.007	0.22	0.011	0.21
Log (GDP per capita)	9.481	0.730	0.084	0.34	-0.060	-1.27	0.039	0.55	-0.042	-0.12
Country Herfindahl Index	0.121	0.171	1.137	1.56	0.389 ***	2.63	0.322	2.13	-0.082	-0.09
Industry Herfindahl Index	0.206	0.227	-1.084	-1.43	-0.380 ***	-3.48	-0.278 ***	-2.59	0.149	0.15
Detrended Turnover (Lagged)	-0.067	0.922	0.025	1.6	0.028 *	1.68	0.040 **	2.06	0.021	0.89
Market Return (Lagged)	0.110	0.330	0.081 *	1.73	0.122 ***	2.62	0.108 *	1.76	0.078	1.26
Good Government Index	24.199	4.601			0.018 **	2.43	-0.007	-0.65		
Log (Country Size)	12.668	2.071			-0.017 **	-2.02	-0.012	-1.26		
Earnings Comovement Index	0.330	1.007					-0.014	-0.81		
Dependent Variable	0.042	0.340								
Test ADR0=ADR1 (p-value)			(0.4334)		(0.3482)		(0.6993)		(0.5641)	
Number of Observations			528		496		323		225	
Within R-Square			0.139		0.134		0.134		0.148	
Between R-Square			0.035		0.197		0.078		0.041	
Overall R-Square			0.072		0.169		0.154		0.035	
Year Fixed Effect			Yes		Yes		Yes		Yes	
Country Fixed Effect			Yes		No		No		Yes	
Country Random Effect			No		Yes		Yes		No	

Dependent Variable: Skewness of Individual Stock Raw Return										
	Mean	Std.Dev	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Short Sales Allowed and Practiced	0.598	0.491	0.166	0.93	-0.012	-0.18	0.056	0.69		
ADR0	0.057	0.232	-0.138	-0.62	0.029	0.23	0.059	0.29	0.019	0.06
ADR1	0.168	0.374	-0.093	-0.43	-0.030	-0.24	0.031	0.18		
Log (Number of Firms)	4.605	1.674	-0.033	-0.56	0.003	0.10	0.019	0.51	-0.012	-0.12
Days with Zero Return (%)	-0.943	1.004	0.024	0.48	0.009	0.25	-0.011	-0.2	0.097	1.59
Log (GDP per capita)	9.481	0.730	-0.113	-0.32	-0.038	-0.47	0.055	0.48	-0.218	-0.51
Country Herfindahl Index	0.121	0.171	-0.076	-0.07	-0.063	-0.25	-0.036	-0.14	-1.282	-1.11
Industry Herfindahl Index	0.206	0.227	-0.019	-0.02	-0.109	-0.56	0.025	0.14	1.156	0.95
Detrended Turnover (Lagged)	-0.067	0.922	0.011	0.45	0.015	0.61	0.026	0.81	-0.023	-0.81
Market Return (Lagged)	0.110	0.330	0.091	1.31	0.118	1.70	-0.044	-0.43	0.217 ***	2.88
Good Government Index	24.199	4.601			0.004	0.34	-0.020	-1.11		
Log (Country Size)	12.668	2.071			0.000	-0.03	0.009	0.54		
Earnings Comovement Index	0.330	1.007					-0.007	-0.25		
Dependent Variable	0.063	0.459								
Test ADR0=ADR1 (p-value)			(0.7011)		(0.5778)		(0.8643)		(0.9553)	
Number of Observations			528		496		323		225	
Within R-Square			0.117		0.110		0.102		0.259	
Between R-Square			0.034		0.119		0.107		0.004	
Overall R-Square			0.071		0.117		0.107		0.100	
Year Fixed Effect			Yes		Yes		Yes		Yes	
Country Fixed Effect			Yes		No		No		Yes	
Country Random Effect			No		Yes		Yes		No	

Table 6. Skewness and Short-Selling Restrictions

The dependent variable is the skewness of  $\log(1+r)$ , where  $r$  denotes stock returns in each country and year. The skewness of raw returns is calculated as the skewness of the total sample of weekly stock returns in each country and year. The skewness of abnormal returns is the skewness of  $\log(1+u)$ , where  $u$  is the residual of a regression of weekly stock returns on the market index, for each firm in every country and year. The skewness of the market return is the skewness of the value-weighted market index return, in each country and year. The number of firms is the number of firms with available stock price data in Datastream, in each country and year. Country Herfindahl index is calculated as the sum of the market shares (squared) of every firm in each country and year, relative to the corresponding country's total sales. Industry Herfindahl index is calculated as the sum of the market shares (squared) of every industry in each country and year, relative to the corresponding country's total sales. The size of the country is the extension of a country in square kilometers, from [www.yahoo.com](http://www.yahoo.com). The earnings comovement index is calculated as in Morck et al. (2000). The Good Government index is the sum of the Risk of Expropriation, Corruption, and Repudiation of Contract indices from La Porta et al. (1997). The Short Selling variable is a dummy variable that equals one when short selling is allowed and practiced in a given country and year, zero otherwise. ADR1 equals 1 if the observation corresponds to ADR stocks in countries where short sales are allowed and practiced, zero otherwise. ADR2 equals 1 if the observation corresponds to ADR stocks in countries where short sales are not allowed / not practiced. The sample includes firms from 47 countries with stock price information available from Datastream. Macroeconomic variables are from the Economist Intelligence Unit database. All regressions include year-fixed effects. Standard errors are White-heteroskedasticity consistent.

	Dependent Variable: Average Standard Deviation of Individual Stock Return									
	Mean	Std.Dev	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Short Sales Allowed and Practiced	0.5984	0.4906	0.0454	0.85	-0.037	-0.77	-0.021	-0.53	-0.063	-1.49
ADR0	0.0571	0.2323	0.3345	4.60	0.012	0.30	0.179 ***	2.82	0.193 *	1.82
ADR1	0.1683	0.3744	0.2716 ***	3.99	0.089 ***	3.49	0.100 *	1.67	0.143 *	1.74
Log (Number of Firms)	4.6052	1.6739	0.1417 ***	7.13			0.096 ***	5.84	0.092 ***	4.31
Days with Zero Return (%)	-0.9435	1.0043	-0.2223 ***	-15.01			-0.220 ***	-14.87	-0.189 ***	-9.48
Log (GDP per capita)	9.4806	0.7295	-0.0683	-0.63	0.060	0.74	-0.139 **	-2.17	-0.081	-0.73
Country Herfindahl Index	0.1206	0.1706	0.0962	0.28			0.032	0.18	0.014	0.07
Industry Herfindahl Index	0.2060	0.2265	-0.0718	-0.20			0.046	0.27	0.034	0.17
Good Government Index	24.1991	4.6006			-0.027 **	-2.07	-0.024 **	-2.41	-0.019	-1.08
Log (Country Size)	12.6676	2.0712					-0.008	-0.65	0.014	0.78
Earnings Comovement Index	0.3301	1.0069							0.053 *	1.71
Variance in GDP growth	0.0013	0.0011							22.724	0.70
Dependent Variable	-3.0236	0.2893								
Test ADR0=ADR1 (p-value)			(0.1314)		(0.1073)		(0.0648)		(0.4552)	
Number of Observations			630		617		564		375	
Within R-Square			0.43		0.19		0.41		0.54	
Between R-Square			0.09		0.23		0.62		0.75	
Overall R-Square			0.18		0.20		0.53		0.64	
Year Fixed Effect			Yes		Yes		Yes		Yes	
Country Fixed Effect			Yes		No		No		No	
Country Random Effect			No		Yes		Yes		Yes	

Table 7. Distribution of Stock Returns and Short-Selling Restrictions

The dependent variable is the standard deviation of individual stock returns, averaged across countries and years. The number of firms is the number of firms with available stock price data in Datastream, in each country and year. Country Herfindahl index is calculated as the sum of the market shares (squared) of every firm in each country and year, relative to the corresponding country's total sales. Industry Herfindahl index is calculated as the sum of the market shares (squared) of every industry in each country and year, relative to the corresponding country's total sales. The size of the country is the extension of a country in square kilometers, from [www.yahoo.com](http://www.yahoo.com). The earnings comovement index is calculated as in Morck et al. (2000). The Good Government index is the sum of the Risk of Expropriation, Corruption, and Repudiation of Contract indices from La Porta et al. (1997). The Short Selling variable is a dummy variable that equals one when short selling is allowed and practiced in a given country and year, zero otherwise. ADR1 equals 1 if the observation corresponds to ADR stocks in countries where short sales are allowed and practiced, zero otherwise. ADR2 equals 1 if the observation corresponds to ADR stocks in countries where short sales are not allowed / not practiced. The sample includes firms from 47 countries with stock price information available from Datastream. Macroeconomic variables are from the Economist Intelligence Unit database. All regressions include year-fixed effects. Standard errors are White-heteroskedasticity consistent.

	Dependent Variable: Frequency of Extreme Return (Less than 2x Standard Deviation)													
	Mean	Std.Dev	Coefficient	t-stat										
Short Sales Allowed and Practiced	0.598	0.491	0.126	0.67	-0.115	-1.31	0.002	0.02	-0.107	-1.03				
ADR0	0.057	0.232	-0.510	-2.00	-0.087	-0.74	-0.373	**	-2.26	-0.737	***	-3.07		
ADR1	0.168	0.374	-1.021	***	-4.27	-0.172	**	-2.33	-0.703	***	-4.59	-0.666	***	-3.67
Log (Number of Firms)	4.605	1.674	-0.067	-0.96			0.000	-0.01	-0.027	-0.65				
Days with Zero Return (%)	-0.943	1.004	-0.419	***	-8.07			-0.344	***	-8.21	-0.227	***	-3.89	
Log (GDP per capita)	9.481	0.730	-0.218	-0.57	0.019	0.16	-0.057	-0.48	-0.129	-0.81				
Country Herfindahl Index	0.121	0.171	-1.074	-0.90			0.282	0.82	0.575	*	1.91			
Industry Herfindahl Index	0.206	0.227	1.485	1.20			0.011	0.04	-0.135	-0.58				
Good Government Index	24.199	4.601			-0.010	-0.57	-0.006	-0.33	0.023	0.96				
Log (Country Size)	12.668	2.071					0.030	1.48	0.046	**	2.17			
Earnings Comovement Index	0.330	1.007							0.108	***	2.97			
Variance in GDP growth	0.001	0.001							9.403	0.22				
Dependent Variable	-2.913	0.682												
Test ADR0=ADR1 (p-value)			(0.0005)		(0.5374)		(0.0157)		(0.7228)					
Number of Observations			630		617		564		375					
Within R-Square			0.27		0.14		0.25		0.21					
Between R-Square			0.10		0.12		0.20		0.40					
Overall R-Square			0.17		0.14		0.23		0.25					
Year Fixed Effect			Yes		Yes		Yes		Yes					
Country Fixed Effect			Yes		No		No		No					
Country Random Effect			No		Yes		Yes		Yes					

Table 8. Frequency of Extreme Returns and Short-Selling Restrictions

The dependent variables is the per year number of trading days where the market return is lower than the average market return minus two standard deviations, divided by the total number of trading days. The endogenous variable is mapped on the set of real numbers, with the transformation  $\log(x/(1-x))$ . The mean and standard deviation of the market return is calculated over the same country and year. Country Herfindahl index is calculated as the sum of the market shares (squared) of every firm in each country and year, relative to the corresponding country's total sales. Industry Herfindahl index is calculated as the sum of the market shares (squared) of every industry in each country and year, relative to the corresponding country's total sales. The size of the country is the extension of a country in square kilometers, from www.yahoo.com. The earnings comovement index is calculated as in Morck et al. (2000). The Good Government index is the sum of the Risk of Expropriation, Corruption, and Repudiation of Contract indices from La Porta et al. (1997). The Short Selling variable is a dummy variable that equals one when short selling is allowed and practiced in a given country and year, zero otherwise. ADR1 equals 1 if the observation corresponds to ADR stocks in countries where short sales are allowed and practiced, zero otherwise. ADR2 equals 1 if the observation corresponds to ADR stocks in countries where short sales are not allowed / not practiced. The sample includes firms from Hong Kong, Norway, Sweden, Malaysia, and Thailand, with stock price information available from Datastream. Macroeconomic variables are from the Economist Intelligence Unit database. All regressions include year-fixed effects. Standard errors are White-heteroskedasticity consistent.

**PANEL A: MEDIAN FREQUENCY OF NEGATIVE EXTREME RETURNS**

Year to Law Change	HONG KONG		MALAYSIA		NORWAY		SWEDEN		THAILAND		TOTAL	
	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs
-7										13.34%		13.34%
-6	6.43%									12.91%		9.67%
-5	10.97%		10.31%							7.19%		10.31%
-4	9.67%		8.85%							7.18%		8.85%
-3	8.37%		7.84%							7.74%		7.84%
-2	5.78%		6.55%		7.19%	37.55%				6.06%		6.31%
-1	5.45%	80.00%	7.27%		6.26%	2.49%	6.47%			5.11%		6.26%
0	6.04%	1.54%	4.54%		9.70%	2.86%	5.26%			3.95%		5.26%
1	6.38%	49.36%	7.26%		9.06%	2.30%	5.87%			5.07%		6.38%
2	5.06%	29.43%	5.88%		7.04%	2.50%	7.87%			2.92%		5.88%
3	5.59%	3.14%			9.17%	2.50%	8.43%			2.81%		5.59%
4	8.53%	26.87%			8.25%	2.48%	5.42%			3.34%		5.42%
5	8.01%	8.22%			13.28%	2.11%	6.32%	92.37%				7.16%
6		2.25%			6.57%	2.30%	12.00%	3.07%				6.57%
7					2.55%	2.30%	6.51%	1.92%				4.53%
8					5.29%	32.44%	6.50%	1.92%				5.89%
9					3.31%	2.04%	6.30%	23.46%				4.80%
10							3.50%	1.72%				3.50%

**PANEL B: SKEWNESS OF MARKET RETURNS**

Year to Law Change	HONG KONG		MALAYSIA		NORWAY		SWEDEN		THAILAND		TOTAL	
	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs	Non-ADRs	ADRs
-7										0.22		0.22
-6	0.21									0.48		0.34
-5	0.26		0.33							0.55		0.33
-4	0.21		0.35							0.34		0.34
-3	0.41		0.44							0.14		0.41
-2	-0.05	-1.29	0.43		0.06	-0.17				0.10		0.08
-1	-0.14	0.45	0.15		0.20	-0.25	0.12			-0.17		0.12
0	0.25	0.37	0.13		-0.14	-0.05	-0.30			-0.45		-0.14
1	0.11	1.76	0.42		0.21	0.62	-0.12			-0.16		0.11
2	-0.15	-0.05	-0.27		0.08	-0.11	0.11			0.09		0.08
3	0.39	-0.02			0.02	0.38	0.32			0.01		0.02
4	0.03	0.08			-0.01	-0.14	0.03			0.01		0.03
5	0.03	0.22			0.09	-0.40	0.25	-1.60				0.08
6					-0.13	-0.34	0.23	0.27				0.07
7					0.17	0.06	-0.06	0.74				0.05
8					0.02	0.12	0.55	0.49				0.28
9					-0.33	0.02	-0.03	-0.01				-0.18
10							-0.23	0.20				-0.23

Law Changed in 1996 1996 1995 1995 1992.00 1992.00 1991.00 1991.00 1997 1997

**Table 9. Frequency of Extreme Returns, Market Skewness, and Short-Selling Restrictions, Countries with Regulatory changes only**

Number of trading days where the market return is lower than the average market return minus two standard deviations, divided by the total number of trading days, around the elimination of short selling restrictions. Only the five countries with regulatory changes between 1990 and 2001—Hong Kong, Norway, Sweden, Malaysia, and Thailand—are considered. The sample includes firms from these countries with stock price information available from Datastream. For each firm and year, we calculate the mean and standard deviation of returns, and calculate the number of days where the return is below the average return, minus two standard deviation. We aggregate this number by country and year, and divide by the total number of firm-days in the year with available stock price information.