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Testing Intentional Herding in Familiar Stocks: An Experiment in an International Context

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This paper examines the intentional herd behaviour of market participants within different international markets (Germany, United Kingdom, United States, Mexico, Japan, Spain and France) using a new approach that permits the detection of even moderate herding over the whole range of market return. This approach compares the cross-sectional deviation of returns of each of the selected markets with the cross-sectional deviation of returns of an "artificially created" market free of herding effects. We suggest that intentional herding is likely to be better revealed when we analyse familiar stocks. The results show that only the Spanish market exhibits a significant herding effect.

Keywords: International capital markets, Efficiency, Herd behavior, Behavioral finance

INTRODUCTION

The efficient markets hypothesis has been one of the most widely criticized theories in the financial literature in recent years on the basis that investors may exhibit irrational and predictable biases mainly attributed to psychological factors (see, e.g., Odean [1998], Barber and Odean [2000]). Nevertheless, research in cognitive sciences and financial economics suggests there is an important link between rationality and emotion in decision making (Elster [1998], Lo [1999], Loewenstein [2000], Peters and Slovic [2000]), implying that the two notions are not antithetical, but in fact complementary, given that psychological factors may be compatible with the optimizing behaviour of the agents. Trading and active portfolio management involve sophisticated brain functions such as logical reasoning, numerical computation, and short- and long-term planning which may often be tempered by emotional responses such as fear. A key element in this context is the prevalence of loss aversion (Kahneman and Tversky [1979], Tversky and Kahneman [1986]). Olsen [1997] suggests that the different perception of risk among investors depends on how investors are able to manage individual losses and their ability to control and reduce the probability of losses. Investors' preference for the avoidance of loss may imply that significant fluctuations in prices are not necessarily related to the arrival of information on economic or financial variables but may also correspond to collective phenomena such as crowd effects or herd behavior. Behavioral finance incorporates these approaches into standard models of financial markets to explain the aggregate effects of decisions taken by individual traders (Thaler [1991, 1993], Shefrin [2000]).

Herding arises when investors decide to imitate the observed decisions of other participants in the market, who are thought to be better informed, rather than follow their own beliefs and information. Whereas sociologists and psychologists identify issues such as herding as part of a wider risk-based approach emerging from a combination of decision contexts and individual propensities, from the viewpoint of strict financial theorists, this distortion of the hypothesis of market efficiency is usually explained in developed markets within the context of the agency theory. There seems to be a compensation-reputation scheme rewarding imitation, so that an investor's compensation depends on how his performance compares to other investors' performance and on whether deviations from the consensus are potentially costly (Scharfstein and Stein [1990], Roll [1992], Brenan [1993], Rajan [1994], Trueman [1994], Maug and Naik [1996], among earlier references). In emerging markets, herd behavior may be

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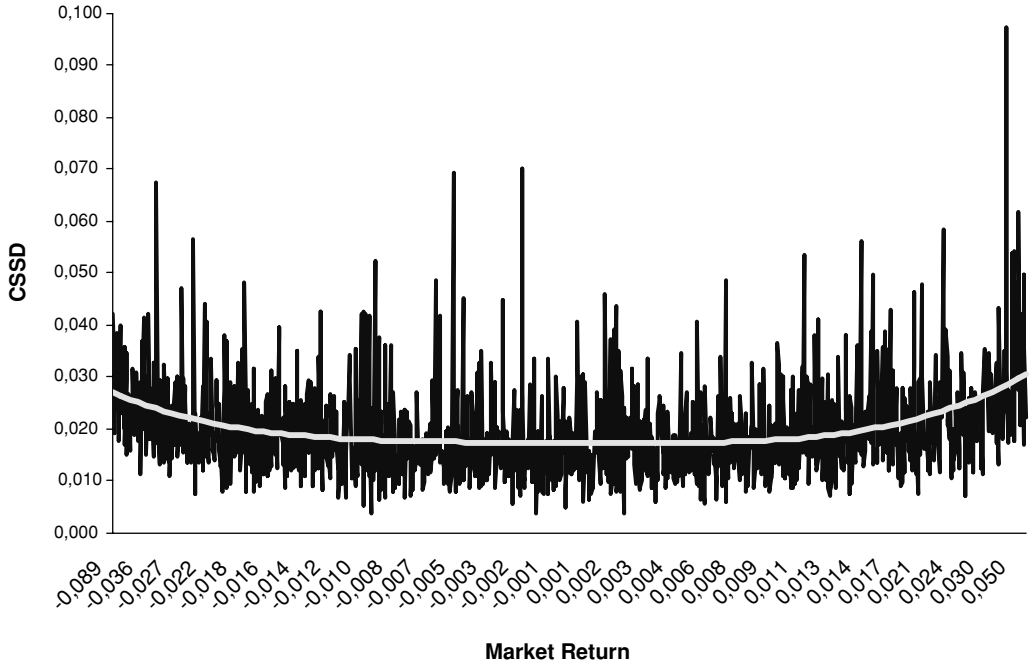

FIGURE 1 CSSD Across Market Return Values (tendency highlighted)—Germany

merely due to imperfect information (see, e.g., Chari and Kehoe [1999], Calvo and Mendoza [1998], Bikhchandani, Hirshleifer and Welch [1998]). Differences in factors such as the relative importance of institutional versus individual investors (Lakonishok, Shleifer and Vishny [1992], Grinblatt, Titman and Wermers [1995] and Wermers [1999] assess the presence of herding behavior among mutual funds) or the level of sophistication of derivatives markets may affect investors' decisions in these emerging markets.

However, stock assessment also depends on individual perceptions. Shefrin and Statman's [1999] results suggest that analysts evaluate stocks not only in terms of risk/return relationships but also in terms of global attitudes toward these stocks. According to Ganzach [2000], familiarity is

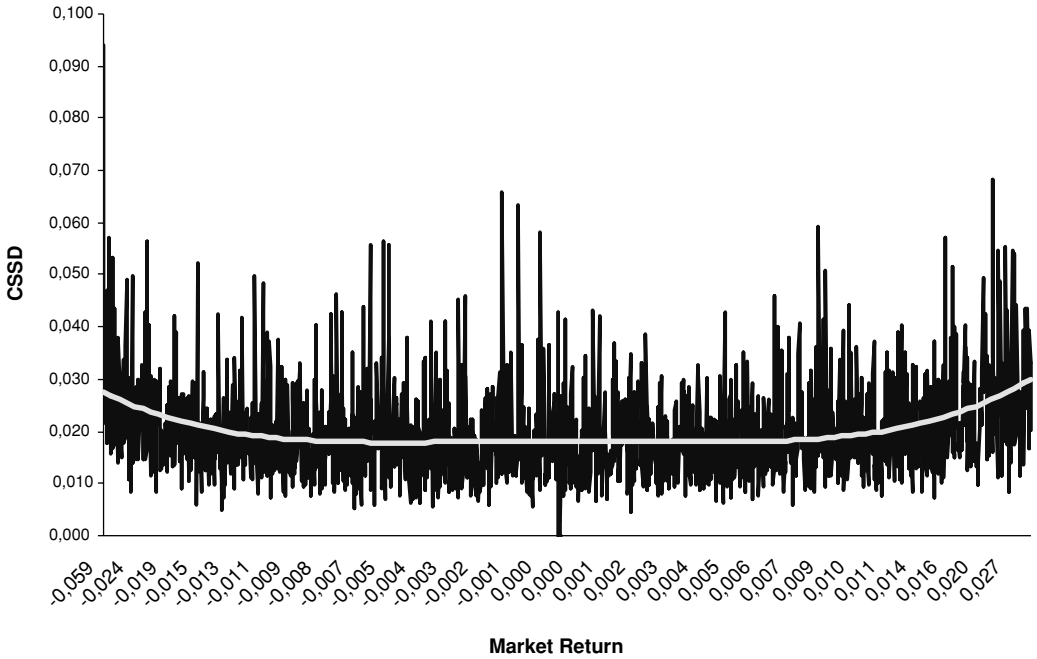

FIGURE 2 CSSD Across Market Return Values (tendency highlighted)—United Kingdom

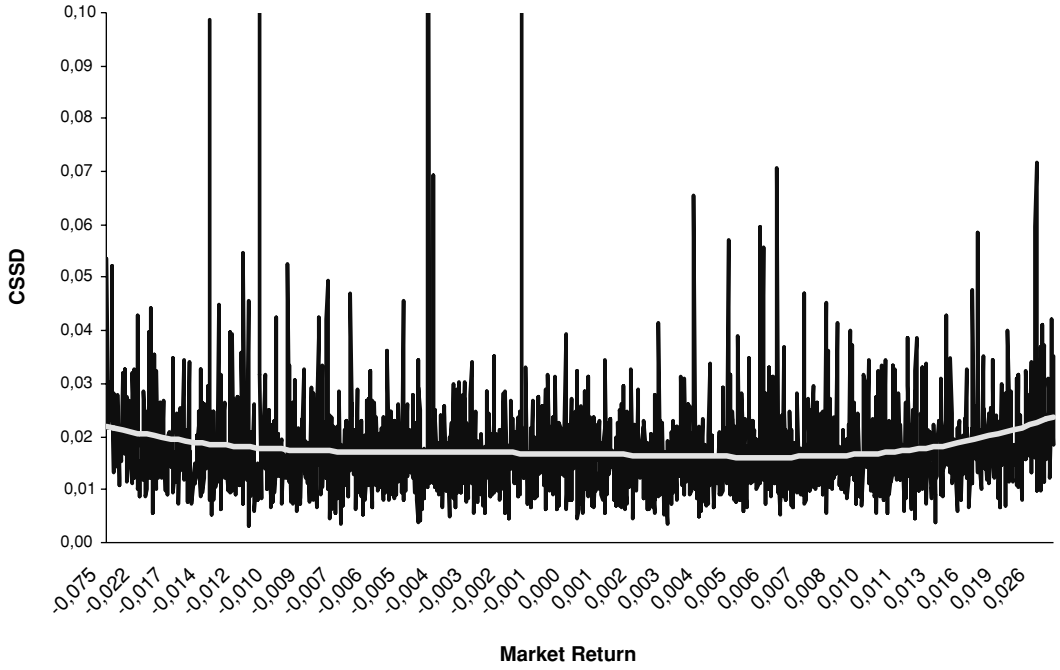

FIGURE 3 CSSD Across Market Return Values (tendency highlighted)—United States

also shown to affect preference in the analysis of financial data. For unfamiliar assets, judgments and perceptions tend to reflect previously formed overall evaluations or preferences rather than reflecting specific distinct attributes of the asset under consideration. However, in making judgments of familiar assets, participants directly access relevant information.

Because of the central role of perceptions in decision making in financial markets, it seems to be important to find valid means of analyzing issues such as herd behavior. From an empirical perspective, the aim of this paper is to test the presence of mimetic agents in seven international stock markets (Germany, United Kingdom, United States, Mexico, Japan, Spain, and France). To this end, we analyze familiar stocks. If herding is found in familiar stocks, such mimetic behavior is likely to be intentional, given that if investors can easily access relevant information about these titles, their decision to herd conforms with an intentional preference for following the decision of other participants. Furthermore, if those leader titles with frequently released and easily processed information induce herding effects, the market as a whole is likely to follow a pattern of aggregate behavior.

At an intuitive level, intentional herding implies a follow-the-leader relationship that might be statistically described by a lower cross-sectional deviation of returns, given that individual asset returns will not diverge substantially from the overall market return. Papers by Christie and Huang [1995] and Chang, Cheng and Khorana [2000] (henceforth referred to as CH and CCK, respectively) are often referenced in herding literature in connection with this intuition. These authors examine the herd behavior of market participants by utilizing different methodologies focused on the cross-sectional deviation of returns under various market conditions.

In spite of the significant usefulness of both methodologies for describing and detecting herd behavior, an unresolved question remains: How does the cross-sectional standard deviation of returns (henceforth CSSD) behave in a market without herding effects? Both CH and CCK set out results that would clearly be found in the presence of significant imitation, but we cannot conclude there is no herding effect in the absence of such results, given that we do not know how a theoretically "herding-clean" market would function. In this paper we propose an alternative, less-stringent approach for shedding light on this question and, furthermore, for detecting moderate levels of herd behavior.

To do this, we need to compare the CSSD distributions of the market under study with those arising from a stock market in which managers respect their own private information and do not intentionally mimic the actions of others. As we suggested before, herd behavior is a relative concept which may be difficult to test. On the one hand, financial markets tend to function with moderate "intrinsic" herding levels. According to Prechter [2001], unconscious impulses that evolved to attain positive values and avoid negative values spur herding behavior, making rational independence extremely difficult to exercise in group settings and producing collective agreement in thought and action. Although these primitive impulses and emotions operate independently of reasoning, we may not label them irrational because they have a purpose in a utility-maximizing sense when knowledge is lacking or logic irrelevant, or if individuals merely

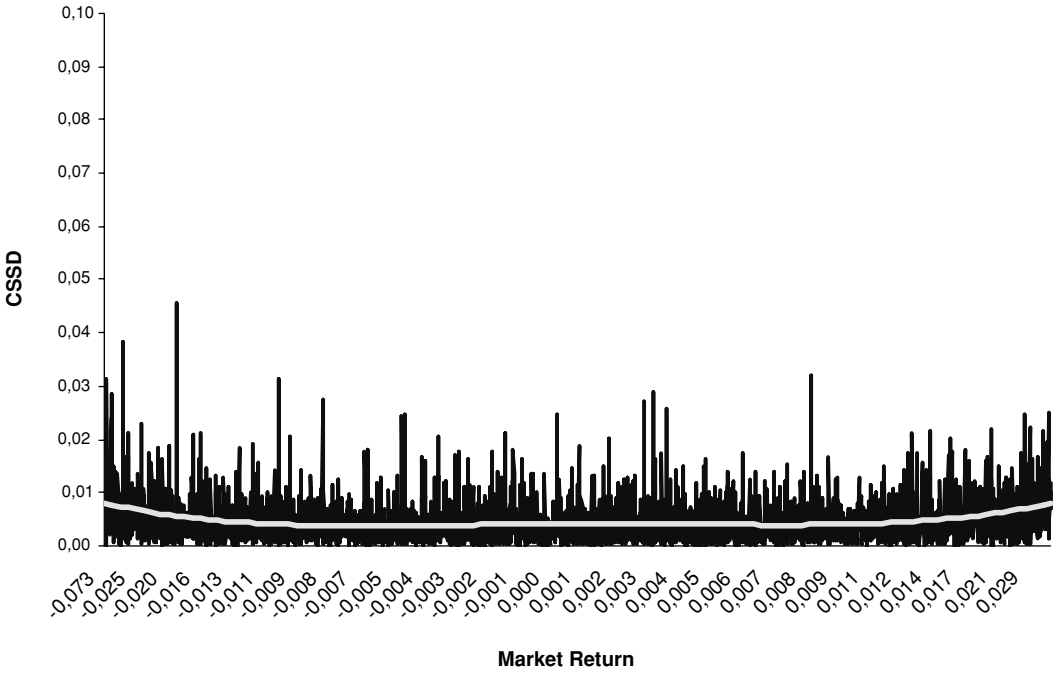

FIGURE 4 CSSD Across Market Return Values (tendency highlighted)—Spain

have a certain level of intrinsic preference for conformity (Grinblatt and Keloharju [2000]). Nevertheless, we should differentiate them from intentional herding.

Intentional dependence upon the behavior of others is a rational decision that becomes a substitute for rigorous reasoning when information is available. In a realm such as investing, economic agents abdicate their responsibility to operate following their own information in matters that are suspected to have strong market agreement or when other participants are thought to be better informed, even at times when information is scarce.

On the other hand, rational pricing models are usually based on strict hypotheses of rational expectations that do not fully consider the evolution of financial markets, the possibility of contagion among markets or assets or, as mentioned above, emotional responses or psychological factors characterizing market reality that may be complementary with rationality in decision making.

This is why we need to create the CSSD distribution of a comparable situation artificially created and reasonably identified as clean of intentional herding effects. The intuition underlying our approach is simple and permits a comparison of herding levels in relative terms. A stock market is said to intentionally herd if we can find significant differences in the level of mimetic behavior when compared with others that are assumed not to exhibit any significant herding effect (or at least not significant intentional herding effects), although they may exhibit other practical imperfections. To do this we need an index representing this artificial market as well as a number of individual assets that basically respond to their own information and whose trading is mainly justified by their own attributes, rather than to the existence of mimetic or aggregate behavior. In this paper we propose the use of real data selected in the international context to replicate the situation under analysis, rather than an artificially generated time series. Real data could provide a more effective basis for the examination of intrinsic herding than a statistical model imposed on an artificially generated series.

The remainder of the paper is organized as follows. In section 2, we describe the methodology and data. In section 3, we provide a discussion of the empirical results and, finally, in section 4 we summarize our findings.

METHODOLOGY AND DATA DESCRIPTION

In the presence of intentional herd behavior, individuals are more likely to suppress their own beliefs in favor of the market consensus; therefore, the returns on individual stocks cluster more tightly around the total market return. CH suggest that this phenomenon is particularly intense during periods of substantial price changes. The rationale is that during such periods markets are less discriminating of individual stocks and treat all stocks similarly. Nevertheless, herding around the market return may be possible at any given time. Investors may adopt strategies that imitate the general market movement independently of the market volatility or the information arriving in the market.

Table 1 shows the results of the Z-tests for the differences in the mean of the cross-sectional standard deviations series. As can be appreciated, all the Z-statistics are significant, but

TABLE 1
Z-tests for the Differences in the Mean of the Cross-sectional Standard Deviations Using the Total Samples

	Herding-clean market	Germany	United Kingdom	United States	Spain	Mexico	Japan	France
Mean	0.01537147	0.01977821	0.01987318	0.01770674	0.00461298	0.01613173	0.02316546	0.0198448
Variance	5.42544E-05	8.4592E-05	8.1065E-05	0.00013909	1.8272E-05	4.5091E-05	0.00012499	7.9229E-05
Z statistic		13.5539273	15.380671	6.70858104	-50.013472	2.40167205	21.7295295	15.3981908
P(Z<=z) one tail		0	0	9.8263E-12	0	0.00816017	0	0
Critical value (one tail)		1.64485363	1.64485363	1.64485363	1.64485363	1.64485363	1.64485363	1.64485363
P(Z<=z) two tails		0	0	1.9653E-11	0	0.01632033	0	0
Critical value (two tails)		1.95996398	1.95996398	1.95996398	1.95996398	1.95996398	1.95996398	1.95996398

Note. Differences in the mean are computed subtracting the mean corresponding to the absence of intentional herding from the mean corresponding to each of the markets under study.

the direction (positive or negative) of the rejection is different. The Spanish market shows a significantly lower mean than the notional market, and we interpret this finding as evidence in favor of intentional herd behavior.

Following the idea presented in CH, we propose to exploit the information held in the cross-sectional movements of the market (CSSD) to detect herd behavior. In the presence of the herd effect, the cross-sectional dispersion at any given time should become smaller than when there is no herding, and prices may not correspond to their fundamental value during short time periods. The CSSD measure is defined as

$$\mathrm{CSSD}_t = \sqrt{\frac{\sum_{i=1}^{n} (R_{it} - R_{mt})^2}{n-1}}$$

where R_{it} is the observed stock return on firm i at time t and R_{mt} is the aggregate market portfolio at time t. This dispersion measure quantifies the average proximity of individual returns to the market return on day t. What is relevant at this point is to determine what the distribution of CSSD would be in the absence of intentional herd behaviour. This "herding-clean" distribution will be the reference in order to test the relevance of mimetic actions in any other market at any time.

Our empirical test focuses on seven international capital markets: Germany, United Kingdom, France, Spain, Mexico, the United States and Japan. For each of these markets, the data base consists of daily stock prices over the period January 1998–April 2004 for ten individual stocks[1] selected among the most heavily traded within each market and, therefore, identified as familiar assets, as well as the corresponding representative market index (see Appendix I).

To replicate the CSSD distribution of a comparable situation artificially created without any intentional herding effect, we must take into account several factors. First, we need an index representing the market containing a number of individual assets that basically respond to their own information and whose trading is mainly justified by their own attributes, rather than to the existence of relevant mimetic or aggregate behavior. That is, we should bring our "intentional herding-free" index close to the usual definition of market efficiency. A naive market model in which agents do not interact with each other would tend to give rise to normally distributed aggregate fluctuations. Orlean [1995] in a framework inspired by the Ising model considers a model of identical agents making binary decisions in which any two agents have the same tendency to imitate each other and studies the resulting Bayesian equilibria. In terms of aggregate variables, this model leads to a Gaussian distribution when the imitation is weak. We use these results to construct our "intentional herding-free" index but allowing some intrinsic tendency to conformity and mimetic behavior.

Second, to guarantee the choice of individual assets that do not represent aggregate behavior with the market, we need to identify individual assets with a low degree of correlation among them. Statistical correlation may be clearly identified with mimetic behavior. Identical actions, even mistaken, are positively correlated.

Third, the use of real data rather than artificially generated time series provides a better basis for the analysis of intrinsic herding. Sornette and Johansen [1997] specifically propose that any market as a whole can exhibit an 'emergent' herding behavior at a macroscopic scale not shared or consciously assumed by any of its individuals at a microscopic scale. This implies that using real data and, more specifically, real international indexes, we are already assuming intrinsic herding. Other authors such as King and Wadhwani [1990] and King et al. [1994] show that little world stock market co-movement can be accounted for by observable economic factors but is mainly due to unobservable factors such as investor sentiment. Although factors such as the number of overlapping opening hours, sharing a common border or the existence of direct trade among countries tends to increase cross-country stock market correlation, neither Groenen and Franses [2000] nor Heaney et al. [2000] observe a world market but rather clusters of markets that we can consider comparable to activity sectors in domestic markets. All these arguments may indicate that averaging international indexes as if they were individual assets, we could re-create a market by statistical analogy free of intentional herding but exhibiting an intrinsic tendency to herd in which there are groups of assets sharing more characteristics than others. This approach is analogous to the one suggested by Ioannides [1990] to model, for example, price and dispersion: a market represents a collection of agents clustered into small "trading groups," that is, groups of market agents trading among themselves, with little or no trade between different trading groups. Each trading group acts as a minimarket with its own price, supply, and demand.

To proceed with the CSSD replication, we first generate a fictitious equally weighted stock index as the average of 28 real (and diverse) international stock indexes. Correlations are generally lower between international than domestic markets. This has been the driving force behind the literature advocating international diversification and implies, by construction, the lowest likely intentional herding levels. Second, we select the ten least correlated international indexes and identify them with non-intentionally imitative individual behavior; that is, we consider these assets (indexes) representative of the guaranteed absence of intentional herd behavior. Third, we calculate the CSSD distribution of these ten indexes with respect to the fictitious equally weighted stock index and thus determine a proxy distribution for CSSD in the absence of intentional imitating behavior. Finally, we compare the CSSD of the markets under study with that computed in the absence of intentional herding effect. In the presence of intentional herd behavior (where individuals ignore their own beliefs and base their investment decisions on the aggregate behavior of the market), individual returns will not deviate significantly from the overall market return and, therefore,

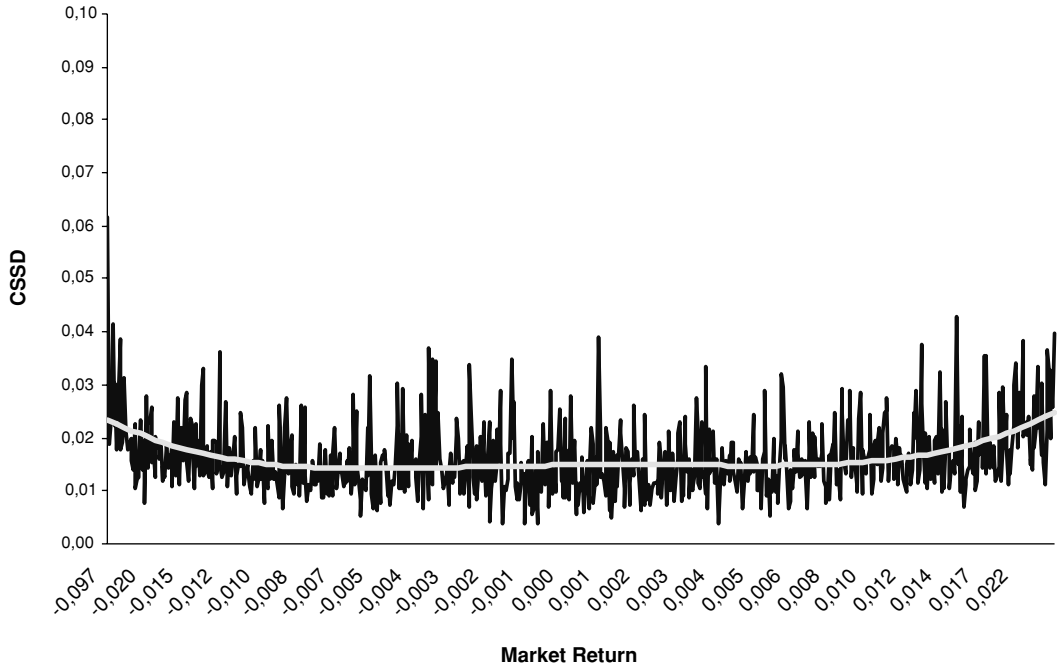

FIGURE 5 CSSD Across Market Return Values (tendency highlighted)—Mexico

this behavior will lead to a CSSD distribution significantly displaced to the left, with a lower mean and a higher kurtosis degree than the distribution corresponding to the absence of herding.

In order to determine the CSSD distribution in the absence of herd behavior we suggest the following steps:

1. We compute the daily return time series corresponding to a notional market index (NMI_t) constructed as the daily averaged return of 28 international stock indexes over the period January 1998-April 2004 (CAC40-France, SMI-Switzerland, AEX AMSTERDAM-Netherlands, MERVAL-Argentina, JSE-South Africa, DOW JONES-

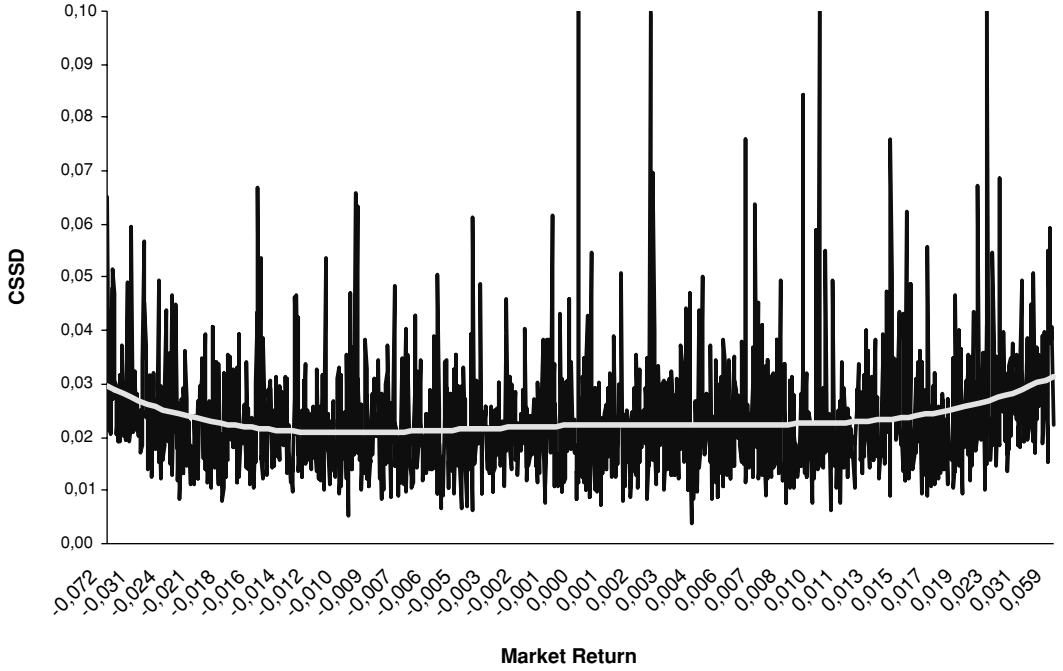

FIGURE 6 CSSD Across Market Return Values (tendency highlighted)—Japan

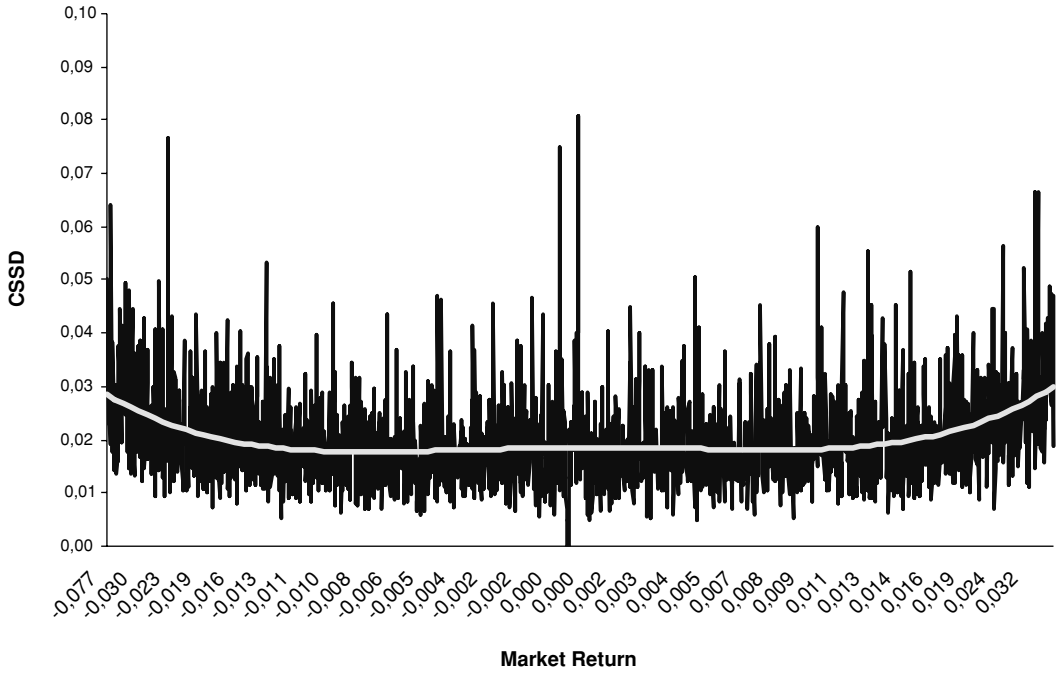

FIGURE 7 CSSD Across Market Return Values (tendency highlighted)—France

USA, SET BANGKOK-Thailand, IBEX35-Spain, ST SINGAPORE-Singapore, IGBVL LIMA-Peru, RTS MOSCOW-Russia, MIB30-Italy, IPC MEXICO-Mexico, KUALA LUMPUR-Malaysia, NIKKEI-Japan, TEL-AVIV 100-Israel, JAKARTA-Indonesia, HELSINKI ALL-Finland, DAX-Germany, CMA EL CAIRO-Egypt, KOSPI SEOUL-South Korea, FTSE100-United Kingdom, HANG SENG-China, IGPA-Chile, IBOVESPA-Brazil, KFX COPENHAGEN-Denmark., SYDNEY-Australia; ATHENS GRAL-Greece).

The use of indexes in an international context is interesting since differences in factors such as the relative importance of institutional versus individual investors, the quality and level of information disclosure, the level of sophistication of derivatives markets, and so forth., can affect investor behavior in each market and, therefore, each

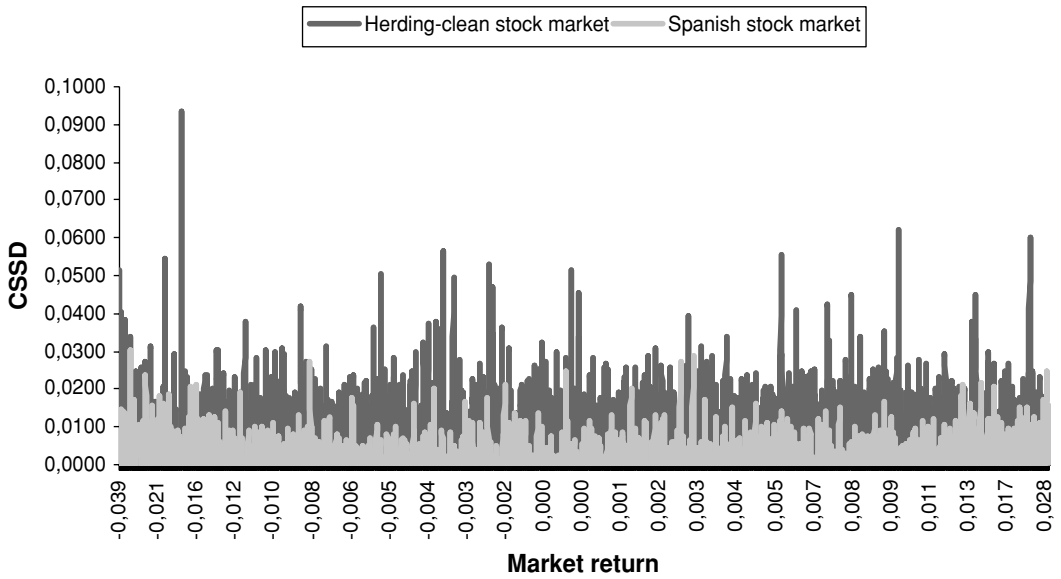

FIGURE 8 FIGURE 8 CSSD in the Spanish Market vs. a "Herding-clean" Market

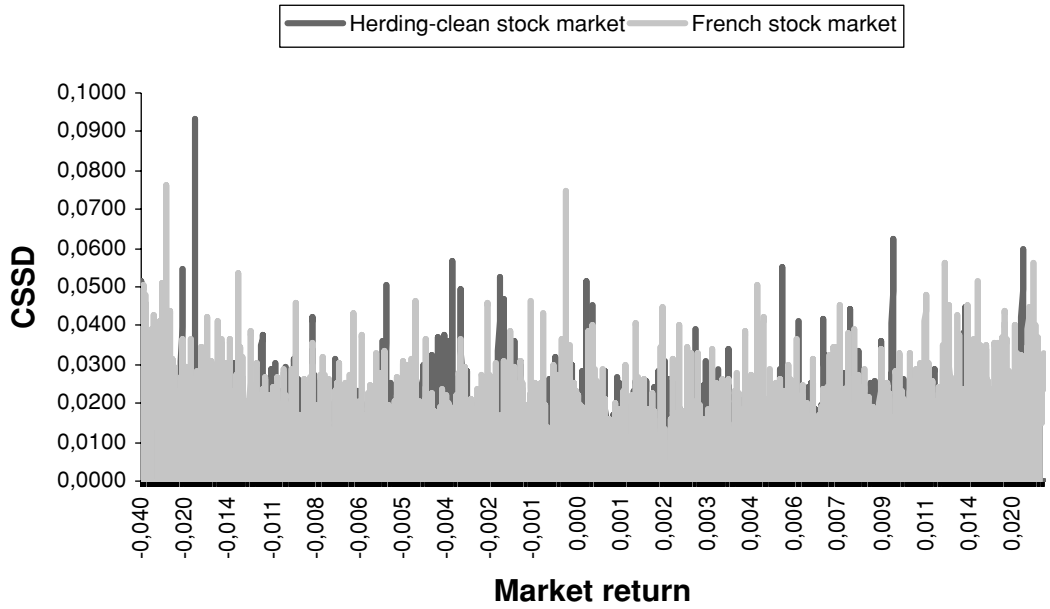

FIGURE 9 CSSD in the French Market vs. a "Herding-clean" Market

of the 28 indexes may be identified with an individual financial asset whose evolution depends significantly on the information available in its own domestic market. In this way, the notional index brings together, a priori, very different individual behaviors responding to very different circumstances and very different characteristics that induce, at most, intrinsic herd behavior. As we mentioned before, under the assumption of, at most, weak imitation, the daily return time series of the notional index should behave as a Gaussian distribution. The results of applying the Kolmogorov test to decide if our sample comes from a population with a normal distribution support these arguments, indicating that we can not strongly reject normality of the return distribution[2] The value of the Kolmogorov statistic D is 0.0327 with a p-value of 10.88%. Although we can't reject the null hypothesis of normality, there are some features in the distribution that could easily be related to the presence of intrinsic herding, namely little excess kurtosis that has been documented as a sign of herd behavior in stock markets (Cont and Bouchaud, 2000).

2. We assess the correlation between each international index with each of the other 27 indexes through the proper correlation matrix, and for each index we select the 10 least correlated. In a second selection, we choose the 10 indexes least correlated with the rest (LCI_j with j=AEX AMSTERDAM, MERVAL, DOW JONES, SET BANGKOK, IGBVL LIMA, KUALA LUMPUR, NIKKEI, JAKARTA, CMA EL CAIRO, KOSPI SEOUL and ATHENS GRAL). These 10 less correlated indexes (LCI_j) are assumed to be individual assets whose daily returns are very likely to behave independently and not to follow the aggregate market. That is, investors would be likely to take their decisions on these individual assets following their own information in their

TABLE 2
Z-tests for the Differences in the Mean of the Cross-sectional Standard Deviations Using Partial Samples (Market Returns under 1.5% and over 1.5%)

	Herding-clean market	Germany	United Kingdom	United States	Spain	Mexico	Japan	France
Mean	0.01495497	0.017940079	0.018598277	0.017135463	0.004146851	0.01527742	0.02219468	0.01846083
Variance	0.00004572	0.000068	0.00006548	0.00015	0.00001443	0.0000368	0.000199	0.00006621
Z statistic		8.67648746	12.66030668	5.741878118	-52.4585150	1.042903475	14.6146267	11.7721757
P(Z<=z) one tail		0	0	4.68161E-09	0	0.1484965	0	0
Critical value (one tail)		1.644853627	1.644853627	1.644853627	1.644853627	1.644853627	1.64485363	1.64485363
P(Z<=z) two tails		0	0	9.36322E-09	0	0.296993	0	0
Critical value (two tails)		1.959963985	1.959963985	1.959963985	1.959963985	1.959963985	1.95996398	1.95996398

Note. Differences in the mean are computed subtracting the mean corresponding to the absence of intentional herding from the mean corresponding to each of the markets under study.

TABLE 3
Z-tests for the Differences in the Mean of the Cross-sectional Standard Deviations Calculated for Market Returns Under -1.5%

	Herding-clean market	Germany	United Kingdom	United States	Spain	Mexico	Japan	France
Mean	0.0221563	0.022157132	0.0235738	0.019336942	0.00617892	0.020259854	0.02425857	0.0227331
Variance	0.000209	0.00007647	0.00011	0.00007022	0.00003368	0.00007735	0.000102	0.00009773
Z statistic		0.000382357	0.63267811	−1.27551945	−7.49323172	−0.78034055	0.95228143	0.26277141
P(Z<=z) one tail		0.499847461	0.26347193	0.101062722	3.364E-14	0.217595225	0.17047714	0.39636338
Critical value (one tail)		1.644853627	1.64485363	1.644853627	1.64485363	1.644853627	1.64485363	1.64485363
P(Z<=z) two tails		0.999694923	0.52694387	0.202125443	6.728E-14	0.43519045	0.34095427	0.79272677
Critical value (two tails)		1.959963985	1.95996398	1.959963985	1.95996398	1.959963985	1.95996398	1.95996398

Note. Differences in the mean are computed subtracting the mean corresponding to the absence of intentional herding from the mean corresponding to each of the markets under study.

particular social setting and not intentionally imitating the actions of others who do not share the same environment.

3. We calculate the empirical time series of CSSD in the absence of herding ($CSSD_{NH}$) as follows:

$$\mathrm{CSSD_{NHt}} = \sqrt{\frac{\sum_{\mathrm{j=1}}^{\mathrm{n}} (\mathrm{RLCI_{jt}} - \mathrm{RNMI_t})^2}{\mathrm{n}-1}}$$

where $RLCI_{jt}$ is the observed stock return on LCI_j on day t with j = 1... 10, and RNMIt is the aggregate daily return in the notional stock market at time t.

4. We compute a simple hypothesis test of the mean (Z-test) of two arbitrary populations to set out the differences between the series $CSSD_{NH}$ and the CSSD for each of the seven markets under study. The null hypothesis in this test is that there is no difference in the mean against the alternative hypothesis of differences in one sense or another. For those markets exhibiting intentional herd behavior a lower mean value is expected. We implement the mean test for two different ranges: for the complete series of CSSD and for the series containing CSSD values calculated under extreme market returns. This second test is useful to highlight the differences, if any, among distributions, and to determine whether, as CH postulate, larger values of CSSD arise together with larger values of market return in the absence of intentional herd behavior.

RESULTS

The results for the Spanish market are consistent, on the one hand, with the findings documented by Blasco et al. [2005]. In this market, stocks tend to react more quickly and strongly to macroeconomic or general information (especially bad news) rather than to firm-specific information. This indicates that prices may respond to factors and effects other than particular items of information. When firm-specific news is released, investors may not be sure of what to expect and may need additional time to analyze the information flow to make appropriate inferences. They consequently take short-term decisions following other market participants, favoring the market consensus. The fact that only the Spanish market shows significant levels of intentional herding behavior could be due to the way in which Spanish investment professionals rely heavily on reasoning by analogy, so that their decision procedures may become more intuitive as complexity increases. They are "satisfiers," not optimizers. Their primary aim is to make an acceptable choice.

In addition the Spanish market shows some features which could make the existence of intentional herding more likely. Among others, we find a heterogeneous behavior from one stock to another in terms of traded volume. Telefónica, BSCH, BBVA, closely followed by Repsol, Endesa and Iberdrola, have a trading volume clearly larger than the rest of the stocks traded in the Spanish market.

Furthermore, some of our results are also consistent with those presented by CCK. Examining individual returns, they find no evidence to support the presence of herding in the developed markets of the United States and Japan, which are also included in our data base[3] These results also agree with the findings in CH for the U.S. market.

Figures 1 to 7 show how the CSSD values vary in each market across the different market return values. It is interesting to note that extreme market returns tend to produce larger deviations. This finding, which is less pronounced in the case of the Spanish market, would be consistent with the rejection of herd behavior according to the methodological proposal suggested by CH[4]

To illustrate a comparison with a "herding-clean" market, in Figures 8 and 9 we plot the CSSD measure of market returns for both the Spanish and French markets against the background of the clean market. As can be seen, the CSSD measure is notably lower in the Spanish market across different market return values. However, the differences between

TABLE 4
Z-tests for the Differences in the Mean of the Cross-sectional Standard Deviations Calculated for Market Returns over 1.5%

	Herding-clean market	Germany	United Kingdom	United States	Spain	Mexico	Japan	France
Mean	0.020571	0.024026294	0.025701094	0.02089301	0.00616562	0.020158029	0.026147218	0.02354476
Variance	0.00006197	0.00011	0.0001	0.00009578	0.00002248	0.00005735	0.0000157	0.00009222
Z statistic		2.419000319	3.548739478	0.22101309	−11.3381739	−0.27265632	4.381131384	2.15970095
P(Z<=z) one tail		0.007781613	0.00019354	0.41254112	0	0.392558706	5.90323E-06	0.01539791
Critical value (one tail)		1.644853627	1.644853627	1.64485363	1.64485363	1.644853627	1.644853627	1.64485363
P(Z<=z) two tails		0.015563227	0.00038708	0.82508224	0	0.785117412	1.18065E-05	0.03079583
Critical value (two tails)		1.959963985	1.959963985	1.95996398	1.95996398	1.959963985	1.959963985	1.95996398

Note. Differences in the mean are computed subtracting the mean corresponding to the absence of intentional herding from the mean corresponding to each of the markets under study.

the French market and the clean market are not so clear. These figures show an additional result: Large values of the CSSD measurements appear over the whole market return range. Therefore, we find a propensity to herd during both quiet periods and periods of crisis. Unlike CH, other authors such as Hwang and Salmon [2001] postulate higher levels of herding during quiet periods.

To expand on our observation and in order to detect possible asymmetric market reactions to bad news, we also calculate the mean test for three market return intervals: when the market return exceeds 1.5%, in quiet periods with the market return oscillating between 1.5% and −1.5% and for market returns under −1.5%. The results are shown in Tables 2, 3 and 4. Although the conclusions remain unchanged, we can appreciate that quiet periods exhibit lower dispersion measures than volatile periods. We also find smaller differences in the dispersion measurements and lower dispersion overall when using negative rather than positive extreme returns. This observation agrees with Olsen [1997], who proves that investors pay more attention to possible negative returns than to signals suggesting positive returns.

Although our results clearly indicate that there are no significant levels of intentional herd behavior in the markets analyzed (except the Spanish market), we have found some significant partial results indicating that the German market showed aggregate investor behavior on quiet days (daily returns between −0.4% and 0.3%) during the years 2002 and 2003 (differences in the mean equal to −0.0011, significant at 10% significance level). Similar results are found for the U.S. market from April 2003-April 2004 (daily returns between −0.3% and 0.3%, differences in the mean equal to −0.0010, significant at 5% significance level). For the Mexican market, we find evidence in favor of herding during December 2001 and January 2002 across the whole range of daily returns (differences in the mean equal to −0.0024, significant at 5% significance level). Using higher significance levels, we find some results in favor of herd behavior for the French market during the two last months of 2003 and the early months of 2004, with significant differences at 12% significance levels. We do not find any significant evidence either for the U.K. market or the Japanese market[5]

CONCLUSIONS

In this paper we present an empirical test for detecting intentional herding, even to a moderate degree, over the whole market return range, using a variant of the methodology first presented by Christie and Huang [1995]. Our empirical proposal consists of a comparison of cross-sectional standard deviation measures in a particular market with those calculated in an artificially created market, which is assumed to be free of intentional imitative behavior. The test is applied to seven international developed stock markets (Germany, United Kingdom, United States, Mexico, Japan, Spain and France) using some of their most familiar (most heavily traded) stocks. Familiar stocks are useful here given that if investors can easily access relevant information about these titles, their decision to herd is consistent with an intentional preference for following the decision of other participants. Furthermore, herd behavior found in familiar stocks permits the inference that herd behavior is likely to be found in the rest of the market, given that if herding effects are induced in those leader titles, the market as a whole is likely to follow a pattern of aggregate behavior.

Our results indicate that only the Spanish market exhibits a tendency to conform with aggregate market behavior. This rational herding effect is detected both during periods of substantial price movements and during periods of calm.

For the rest of the markets, we only find some partial and moderate intentional imitative behavior. For all the markets analyzed, the deviation measures are an increasing function of the absolute market return as asset pricing models predict, which can be interpreted, according to previous methodologies, as evidence against herding effects.

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NOTES

1. Eleven individual stocks in those cases where there were no significant differences in trading volume or when the absence of trading makes the consideration of an additional financial asset useful. The availability of Mexican data starts in 2001.
2. The Kolmogorov-Smirnov (K-S) test (Chakravart, Laha and Roy [1967]) is based on the empirical distribution function.
3. Nevertheless they find significant evidence of herding within two emerging markets (South Korea and Taiwan). These results support the idea that herding is more likely to be found in emerging markets due to the existence of imperfect information and a small number of familiar assets.
4. More precisely, we apply both the CH and the CCK tests and find evidence against herding in all the markets analysed. Particularly in the case of the Spanish market, these results are significantly positive for market returns larger than 1.5% and lower than -1.5% when applying the CH test, indicating that the cross-sectional standard deviation increased under extreme market conditions. Nevertheless, applying CCK, we find a significant negative relation between daily cross-sectional absolute deviation and the squared term of the market portfolio, indicating that herding is prevalent in lower market conditions. However, our results indicate clear intentional herd behavior in the Spanish market over the whole market return range. These results are available from the authors upon request.
5. Our analytical tool provides results that partially agree with the findings presented in Cont and Bouchaud [2000] on the relation between the excess kurtosis observed in asset returns and the tendency of market participants to imitate each other. The largest kurtosis measures correspond to the indexes of Mexico, Spain and U.S. markets, whereas the lowest kurtosis measures correspond to the index of the artificial market and the Japanese market.

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APPENDIX

TABLE 5
Index and individual stocks selected for each market:

Market	Germany	United Kingdom	UnitedStates	Mexico	Spain	Japan	France
Market Index	DAX	FTSE 100	Dow Jones	IPC Mexico	IBEX35	NIKKEI	CAC40
INDIVIDUAL STOCKS	Volkswagen	Cadbury Schw.	Procter & Gamble	Walmex	Acerinox	Nissan Motors	Peugeot
	Schering	Boots Group	Microsoft	Tlevisa CPO	Bankinter	Toshiba Corp.	Michelin
	SAP	Barclays	JPMorgan	Telmex	BBVA	Sanyo Electric	L'oreal
	Henkel	Tesco	IBM	Kimber	Corp.Mapfre	Nomura Holdings	Danone
	BMW	Shell Transp	General Motors	GFNorte	Metrovacesa	Mitsub. Viví.	Carrefour
	Bayer	Smiths Group	General.Electric	GRInbur	Repsol YPF	Matsus.El.Ind	Capgemini
	BASF	Marks&Spenc	ExxonMobil	Comerci UBC	Telefonica	Hitachi	BNP Paribas
	Allianz	British.Airways	Citigroup	Cemex CPO	Endesa	East Jap.Ry	AXA UAP
	Adidas	Vodafone Grp	CocaCola	Bimbo	Iberdrola	Tokyo El.Pwr	Aventis
	Siemens	Royal & Sun	AT&T	Alfa	FCC	Honda Motor	Société Gral
	DT.Bank			AMX L			France Telec