Cross-Country Analysis of Herd behavior in Europe: Evidence from continental, Nordic and the PIIGS countries

Asma Mobarek [1]
Stockholm University
School of Business
SE-106 91, Stockholm, Sweden.
Email: amo@fek.su.se

Sabur Mollah
Stockholm University
School of Business
SE-106 91, Stockholm, Sweden.
Email: sabur.mollah@fek.su.se

Abstract:

This paper performs a comparative analysis of herd behavior among the continental, Nordic and PIIGS countries including both the global and Eurozone crises, which is not addressed before. The major findings of the study suggest that common herding forces exist among similar markets, especially during extreme market conditions. Particularly, the PIIGS markets are more intensely affected by the global financial crisis, but continental and Nordic markets are affected by the Eurozone crisis. Apprehensions heighten among the regulators, policy makers, and investors in the European markets for the herding behavior during volatile market conditions.

JEL Classification: G01, G12, G15

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[1] corresponding author.

1. Introduction

In the aftermath of several widespread global crises, herd behavior in financial markets emerged as a popular terminology in financial literature. Scholars stress that herd behavior by market participants aggravate market volatility, decay market stability, and thereby exacerbate financial markets[2] (Eichengreen et al. 1998; Folkerts-Landau & Garber, 1999; Farman & Stiglitz, 1998; Morris & Shin, 1999; Persaud, 2000; and Shiller, 1990). Academics who map herding effects by empirically testing theoretical models can be classified into two main groups: first, researchers testing with aggregate market data analysis (e.g. Christie and Huang, 1995; Chang et al., 2000; Huang and Salmon, 2004; Wang, 2008) and, second, researchers using data analysis for portfolio investors (e.g. Lakonishok et al., 1992; Wermers, 1999; Truman, 1994; and Welch; 2000, Walter and Weber; 2006). Our study is based on the former group and includes major European markets[3].

The research on herd behavior is widely applied in emerging markets, and only a few focus on developed countries, providing controversial findings [e.g., Hwang and Salmon (2004), Chiang and Zheng (2010)]. In addition, the herd behavior during the global financial crisis (GFC) and Eurozone crisis (EZC) should be different from normal times due to the asymmetric market conditions, but no attempts have been made to capture herd behavior during the consecutive economic crises. The literature on asymmetric market conditions and their impact on herding are not well researched between emerging and developed markets [see, for example, only Chiang and Zheng (2010)]. Our paper contributes to the comparative

[2] The herding behavior is more pronounced during periods of turmoil than during periods of stability. Christie and Huang (1995) stress in their paper that a "herd" is more likely to form under conditions of market stress, when individual investors tend to suppress their own beliefs (cascades) and follow the market consensus.

[3] We consider only developed Europe but including the sovereign effected PIIGS because we focus on the GFC and EZC but we ignore emerging Europe.

analysis of herd behavior among European different group of developed countries[4], where the empirical evidence is limited[5].

Europe has suffered from austerity following the Eurozone sovereign crisis in the PIIGS (Portugal, Italy, Ireland, Greece, and Spain) countries; the entire region is under threat because the European markets are constantly interconnected. The dark side of monetary integration in Europe raises the responsibility of caring for others with unequal economic status. The European Union needs to take responsibility for all countries with uneven status. However, among the developed European countries, Nordic countries are different from the continental European countries, which are similar in nature in terms of legal regimes, corporate governance, ownership structures and macroeconomic environments. Notwithstanding the fact that Finland is a Nordic country, it enjoys a similar status as an EU member state with the EURO as its currency. Although Europe is a common name with a happy family, there are some sub-groups, like the PIIGS, that are unhappy with their own situations. This paper also attempts to investigate the herd behavior of European markets during the GFC and EZC by including the regimes of market shifts and their impact on the PIIGS, Nordic and continental European countries.

Further, the recent study on cross-country herding by Economou et al. (2010) stress that cross-country herd behavior is influenced not only by domestic investors but also by foreign investors, which this paper revisits by considering developed European countries (continental Europe and Nordic) and the countries affected by the Eurozone crisis (e.g. the PIIGS). Herd behavior, both rational and irrational, is expected to be more common during crisis periods rather than during tranquil periods. Thus, it is important to investigate whether different group of countries suffer in the same way or in a different way in Europe.

[4] Continental European countries (e.g. France and Germany), the sovereign infected countries (e.g. The PIIGS- Portugal, Ireland, Italy, Greece and Spain), and Nordic countries (e.g. Sweden, Denmark, Finland and Norway).
[5] Economou et al. (2011) consider only four countries (the PIGS- Portugal, Italy, Greece and Spain) and do not investigate the impact of the Eurozone crisis.

By critically analyzing the study of Holmes et al. (2013) in the Portugal market and Economiu et al. (2011) in the PIGS, we assume that the herd behavior is common in Southern Europe, which is substantially different from continental Europe. Moreover, cross-country herd behavior during the Eurozone crisis is an interesting addition in this paper, which explores the portfolio opportunities for international investors in European markets. Moreover, market regulators and policy makers should express concerns regarding this type of collective herd behavior because it is said to spur unnecessary volatility, which destabilizes markets and increases the fragility of financial systems in the European stock markets

The current study is an extension of Chiang and Zheng (2010) and Economou et al. (2011). These studies capture European herd behavior on a limited scale; our study firstly presents a clearer picture on the European context by incorporating most of developed Europe in the sample. Secondly, Chiang and Zheng (2010) classify the sample as developed, Asian and American blocks, whereas Economou et al. (2011) consider only the PIGS (Portugal, Italy, Greece and Spain) countries as their sample. Neither of these studies considers the Eurozone crisis period while testing the cross-country herding effect; hence, we argue that the PIIGS countries, which were severely affected during the Eurozone crisis, contaminate the herd effect from local to foreign markets via different economic channels during the recent EZC. This might be due to fact that investors are more likely to follow the herd and suppress their private information during financial turmoil. However, we employ the methodology proposed by Economou et al. (2011), which builds upon the earlier work of Chang et al. (2000) and Christie and Huang (1995), but is considered a more novel approach for detecting contemporaneous herd behavior across markets. Furthermore, we examine whether herding exhibits asymmetric effects associated with market returns, trading volumes, and return volatility, as proposed by Chiang and Zheng (2010), whose technique is more robust than those of other concurrent studies (e.g. Tan et al. 2008).

The major findings of our study suggest that herding is not limited to emerging Europe; it also exists in developed Europe and mostly similar within country groups during normal time. However, herd behaviors among the groups differ in extreme market conditions. The cross-country herding analysis further reports a common herding force across a large number of markets in Europe and a strong relationship among similar types of markets. The important finding is that the PIIGS markets are more intensely affected by the GFC crisis and continental and Nordic markets are more affected by the Eurozone crisis than the global crisis. This might be the outcome of contamination from the PIIGS to the Continental and Nordic market during EZC.

The remainder of the paper is organized as follows: Section 2 describes the hypotheses and reviews the related literature. Section 3 presents the data and methods. Section 4 reports the empirical results. Finally, section 5 concludes the paper.

2. Hypotheses Development and Related Literature:

Herding in financial markets has been typically described as the tendency of market participants to mimic the action of others. This collective investment behavior is said to be strongest during extreme market conditions, when market volatility and information flows impede the reliability and accuracy of investment predictions. As a result, investors are more likely to disregard their private information and search for the market-wide consensus, which is seen as a cost-efficient solution compared to the cost of gathering reliable information during a volatile period. In addition, it might be due to the fact that following the herd generates at least the average market return (Gleason et al. 2004). In brief, the underlying causes of this behavior are often either 'rational' (i.e., the investor follows the majority believing that they possess superior information or analytical skills) or 'irrational' (i.e., the investor acts without any rational consideration) [see for example, Hirshleifer and Teoh (2003)].

However, the empirical literature on the market-wide approach focuses on the cross-sectional correlations of the entire stock market and is the main topic of our study. A pioneering study in this field is that of Christie and Huang (1995), who, utilizing the cross-sectional standard deviation of returns (CSSD) as a measure of the average proximity of individual asset returns to the realized market average, introduced an econometrical method to detect herd behavior still in use today. Chang, Cheng and Khorana (2000) extend the model proposed by Christie and Huang (1995) by using a non-linear regression specification. Their results show no evidence of herding on the part of market participants in the US and Hong Kong and partial evidence of herding in Japan. However, during periods of extreme price movements, equity return dispersions for developed countries tend to increase rather than decrease, providing strong evidence against any market-wide herding, which is consistent with Christie and Huang (1995). In addition, for South Korea and Taiwan, the two emerging markets in their sample, they document significant evidence of herding. An extension of Christie and Huang's (1995) method using the cross-sectional absolute deviation of returns (CSAD) in global markets was created by Chiang and Zheng (2010), who, using a sample of 18 countries for the period 1988-2009, find significant evidence of herding in advanced and emerging markets except the US and Latin America.

Further, Gleason, Mathur and Peterson (2004) use intraday data to examine whether traders herd during periods of extreme market movements using sector Exchange Traded Funds (ETFs). Implementing the methods of Christie and Huang (1995) and Chang et al. (2000) and analyzing up and down markets, they report no evidence of herding. They do report a weak presence of asymmetric reaction to news during periods of stress in up markets and down markets, but investors respond to bad news quickly with a higher incentive to mimic the market, which indicates that market participants may fear the potential loss during a down market period of stress more than they might enjoy the potential gains during an up market

period of stress. Similarly, using high frequency data on the Australian market, Henker, Henker and Mitsios (2003) find no evidence of herding towards market portfolios. In addition, even in extreme market conditions, participants seem to have a high level of firm-specific information. The use of daily data in this type of study is firstly motivated by Caporale, Economou and Philippas (2008) and also supported by Tan et al. (2008).

In addition, herd behavior is mostly tested in emerging markets. For example, Tan, Chiang, Mason and Nelling (2008) examine the existence of herd behavior in dual-listed Chinese A and B shares. The results reveal that herding is present in all four markets examined. More recently, Lao and Singh (2011) provide evidence of the presence of herd behavior both in the Chinese stock market during periods of down markets and high trading volumes and in the Indian market during upswings. In addition, the most closely related study to this paper is by Economou et al. (2010), who examine the presence of herd behavior in extreme market conditions for the markets of the PIGS (Portugal, Italy, Greece, and Spain) over the period of 1998-2008. Their results confirm the presence of market-wide herding in the Italian and Greek stock markets, as already shown by Caparelli et al. (2004) and Caporale et al. (2008). In 2011, Economou et al. took their previous study a step further by examining whether the cross-sectional dispersion of returns in one market is affected by the cross-sectional dispersion in the other three markets. They find evidence of a strong co-movement between the cross-sectional dispersions of the four stock markets, indicating that the portfolio diversification benefits are rather small considering these markets. In this context, the current study addresses the issues around cross-country herd behavior, especially investigating the Eurozone spillover of herding from domestic markets to foreign developed European markets.

In the aftermath of the global financial crisis, some studies (e.g., Bakaert, 2011) have found contagion from countries with similar characteristics as a complement to the wakeup call hypothesis (Goldstein 1998). The wakeup call hypothesis assumes that market participants

wake up after a crisis and considers that similar market fundamentals between markets (i.e., the same level of market transparency, level of regulation, and industrial structure) lead to similar market behaviors. However, countries with weak macroeconomic fundamentals are vulnerable to the propagation of financial crises. As long as everything goes well, investors usually do not worry too much about the fundamentals; however, when a crisis hits in some part of the world, people start looking for the next potential victims, and the most likely candidates are the countries that have similar macroeconomic weaknesses. We assume that different markets in Europe are not on the same level in terms of informational dissemination and transparency with heterogeneous firms or industry structure and market efficiency. We expect a heterogeneous pattern for herd behavior among and similar herd behavior within the continental, Nordic and the PIIGS countries according to the wakeup call hypothesis. Thus, we propose first hypothesis as follows:

H_{01}: Country-wise herding effects are not similar among the continental, Nordic and PIIGS countries for the entire sample period.

Moreover, another aspect of studying herd behavior focuses on scattering the cross-sectional correlation of stock returns in response to disproportionately changing market conditions. On investigating the information asymmetry in stock markets, researchers have predicted that investors in these markets are more likely to exhibit herd behavior. For countries with different regimes of boom, bust and market asymmetry within a long sample period, herd behavior may arise differently across different country groups because of overreaction, momentum and information asymmetry. This leads us to test the asymmetry of the market up and down, with positive and negative returns signaling good news and bad news, high and low volume, volatility etc. Thus, our second hypothesis is as follows:

H_{02}: Herd behavior walkouts similarly in different market conditions across different country groups in Europe.

In addition, herd behavior is a key phenomenon to examine and document from both regulatory and investment perspectives. As noted before, it is well known that similar sub-group of European countries may have similar institutional, cultural, economic and financial linkages, which differ across different group of markets. This observation motivates us to test our third hypothesis as follows:

H_{03}: There is no cross-country herd behavior among similar and different country groups.

Finally, the herd behavior in foreign markets during the global crisis (e.g. Economou et al. 2011) raises a research issue for the European countries because the Eurozone crisis devastated the European countries. Country-wise herding behavior might be influenced by foreign markets in addition to domestic markets due to flights to quality [see, for example, Allen and Gale (2000)], portfolio rebalancing [Brunnermeier and Pederson (2005); Brunnermeier and Pederson (2009)], liquidity channels, and risk premium channels under the contagion literature [Longstaff et al. (2010)]. Further, in periods of market turbulence, herd behavior may pose a threat to financial stability because initial negative shocks may be exacerbated and amplified via pro-cyclical market mechanisms, which leads us to test our final hypothesis, as follows:

H_{04}: Country-wise herd behavior does not change during the GFC and the EZC.

3. Methodology and data

3.1 Testing Procedure

The testing procedure in this study is based on the assumption that investors are more likely to ignore their private information and go with the market consensus during periods of market distress. With regard to this assumption, we implement the cross-sectional standard deviation (CSSD) method, which was introduced by Christie and Huang (1995), to detect the presence of herd behavior in equity markets as follows:

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N}(R_{i,t} - R_{m,t})^2}{(N-1)}}, \quad (1)$$

where, $R_{i,t}$ is the observed stock return of asset *i* at time *t* and $R_{m,t}$ is the cross-sectional average of the *N* returns in the aggregate market portfolio at time *t*. The dispersion measure quantifies the average proximity of individual returns to the realized average[6].

Chang et al. (2000) argue that a linear and increasing relation between dispersion and market returns, as suggested by standard asset pricing models, does not hold in times of large average price movements. Thus, herd behavior around the market consensus during periods of large price movements is sufficient for converting the linear relation into a non-linear one. To capture this effect, we propose the cross-sectional absolute deviation (CSAD) as a measure of return dispersion, which was implemented by Chang et al. (2000), as follows:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}\left|R_{i,t} - R_{m,t}\right|. \quad (2)$$

The non-linear framework for modeling the relationship between individual stock return dispersions and the market average is specified as follows:

$$CSAD_t = \alpha + \gamma_1\left|R_{m,t}\right| + \gamma_2 R_{m,t}^2 + \varepsilon_t, \quad (3)$$

where, the squared market return ($R^2_{m,t}$) is used to capture the non-linearity in the relationship, α is the constant, γ_1, and γ_2, are coefficients, and ε_t is the error term at time t.

[6] Previous studies suggest that the dispersion in returns will increase with the absolute value of the market return given the normal information flow since market participants trade based on private information, but during crisis periods, participants follow collective actions of the market and hence, individual stock returns tend to cluster around the overall market return, and herding is said to be more prevalent. Thus, the CSSD method suggests that if herding occurs, investors will make similar decisions, leading to lower return dispersions.

This model is implemented to test $\mathbf{H_{01}}$ and Eq. (3) is estimated for each country (*i*). In the absence of herding effects, Eq. (3) assumes $\gamma_1 > 0$ and $\gamma_2 = 0$. Herding effects are present if $\gamma_2 < 0$ (negatively significant).

Because the relationship between CSAD and market returns may be asymmetric, we further examine whether herd behavior is more pronounced when market returns, trading volumes, and return volatility are high. We follow the approach of Chiang and Zheng (2010) and Chiang et al. (2010), who utilize a dummy variable approach in a single model, which is considered to be more robust than that of Tan et al. (2008).

However, we test $\mathbf{H_{02}}$ separately for returns, volume and volatility using Eq. (4-6). The asymmetric behavior of return dispersion with respect to market returns is estimated as follows:

$$CSAD_{i,t} = \alpha + \gamma_1 D^{up}\left|R_{m,t}\right| + \gamma_2(1-D^{up})\left|R_{m,t}\right| + \gamma_3 D^{up}(R_{m,t})^2 + \gamma_4(1-D^{up})(R_{m,t})^2 + \varepsilon_t, \quad (4)$$

where, D^{up} is a dummy variable with a value of 1 for days with positive market returns and a value of 0 for days with negative market returns. In the absence of herding effects, Eq. (4) assumes $\gamma_1 > 0$ and $\gamma_2 > 0$. This model is implemented to test $\mathbf{H_{02\,(a)}}$. Herding effects are present if $\gamma_3 < 0$ and $\gamma_4 < 0$, with $\gamma_4 < \gamma_3$ if these effects are more pronounced during days with negative market returns.

Furthermore, the asymmetric behavior of return dispersions with respect to the trading volume can be estimated as follows:

$$CSAD_{i,t} = \alpha + \gamma_1 D^{Vol-High}\left|R_{m,t}\right| + \gamma_2(1-D^{Vol-High})\left|R_{m,t}\right| + \gamma_3 D^{Vol-High}(R_{m,t})^2 + \gamma_4(1-D^{Vol-High})(R_{m,t})^2 + \varepsilon_t' \quad (5)$$

where, $D^{\text{Vol-High}}$ is 1 for days with a high trading volume and 0 otherwise. The trading volume on day *t* is regarded as high if it is greater than the previous 30-day moving average and low if it is lower than the previous 30-day moving average. In the absence of herding effects, Eq. (5) assumes $\gamma_1 > 0$ and $\gamma_2 > 0$. This model is used to test $\mathbf{H_{02(b)}}$. Herding effects are present if $\gamma_3 < 0$ and $\gamma_4 < 0$, with $\gamma_3 < \gamma_4$ if these effects are more pronounced during days with a high trading volume.

The asymmetric behavior of return dispersion with respect to market volatility is estimated as follows:

$$\begin{aligned} CSAD_{i,t} = \alpha + \gamma_1 D^{\sigma^2-High}\left|R_{m,t}\right| + \gamma_2(1 - D^{\sigma^2-High})\left|R_{m,t}\right| \\ + \gamma_3 D^{\sigma^2-High}(R_{m,t})^2 + \gamma_4(1 - D^{\sigma^2-High})(R_{m,t})^2 + \varepsilon_t' \end{aligned} \quad (6)$$

where, $D^{\sigma_2\text{-High}}$ is 1 for days with high market volatility and 0 otherwise. Market volatility on day *t* is regarded as high if it is greater than the previous 30-day moving average and low if it is lower than the previous 30-day moving average. In the absence of herding effects, Eq. (6) assumes $\gamma_1 > 0$ and $\gamma_2 > 0$. This model is applied to test $\mathbf{H_{02(c)}}$. Herding effects are present if $\gamma_3 < 0$ and $\gamma_4 < 0$, with $\gamma_3 < \gamma_4$ if these effects are more pronounced during days with high market volatility.

In addition, markets that exhibit a certain degree of co-movement with correlated cross-sectional return dispersions are also likely to show synchronized herding patterns to test $\mathbf{H_{03}}$. Following Economou et al. (2011), Eq. (3) is modified by adding explanatory variables for the cross-sectional dispersions of the *n* markets included in our sample as follows:

$$CSAD_{i,t} = \alpha + \gamma_1\left|R_{m,t}\right| + \gamma_2(R_{m,t})^2 + \sum_{j=1}^{n}\delta_j CSAD_{j,t} + \varepsilon_t \quad (7)$$

This model is used to test H_{03}. The delta (δ) is the CSAD coefficients for the other countries (j). The cross-country herding effects are present if $\partial j < 0$.

Finally, this paper also examines whether herding effects are more pronounced during periods of financial crises. A dummy variable, D^{CRISIS}, that is 1 for days of crisis and 0 otherwise is added to the benchmark Eq. (3) as follows:

$$CSAD_{i,t}\alpha + \gamma_1|R_{m,t}| + \gamma_2(R_{m,t})^2 + \gamma_3 D^{CRISIS}(R_{m,t})^2 + \varepsilon_t \qquad (8)$$

This model tests **H_{04}**. We test Eq. (8) using both GFC and EZC dummies separately. Since herding effects are more pronounced during the crises periods and differ among country groups if the crisis coefficients in both crises, γ_3 are less than 0.

3.2 Data

The data set is constructed by the constituent shares of the main indices of Germany (DAX-30), France (CAC-40), Portugal (PSI-20), Italy (FTSE-MIB), Ireland (ISEQ), Greece (ATHEX Composite), Spain (IBEX-35), Sweden (OMXS-30), Norway (OSLO OBX), Denmark (OMXC-20) and Finland (OMXH-25). The sample period stretches from 01-01-2001 to 16-02-2012. Daily returns for the constituent shares are calculated as follows: $R_{it} = \ln(\frac{P_t}{P_{t-1}}) \times 100$. The constructed market portfolio return $R_{m,t}$, which is needed to calculate the CSAD measure in Eq.2, is equally weighted. The Thomson Data stream was used to retrieve stock prices and trading volumes. The GFC and EZC periods are identified as 09 August 2007-31st December 2009 and 02 May 2010-16 February 2012[7]. A description of the data is presented in Table 1 below.

[7] Since BNP Paribas was ceased all its banking operations on the 9th August, 2007, we consider this date as the beginning of GFC. However, by following Ahmed et al. (2011), we set 31st December 2009 as the end date for the GFC. Further, Greece gets its first bailout money of the 2nd May, 2010, which is considered as the beginning of

[Insert Table 1 about to be here]

Table 1 reports the descriptive statistics for the CSAD measure and the market return for each of the eleven markets. The statistics show that the highest mean and standard deviation values of CSAD, which suggest significantly higher market variations across individual firms compared to other markets, are in Norway, Greece and Ireland. Further, a higher standard deviation may suggest that the market had unusual cross-sectional variations due to unexpected news or shocks (Chiang and Zheng, 2010). As expected, we observe that continental Europe (France and Germany) and the Nordic countries (Denmark, Finland, and Sweden) have similar mean and standard deviation values, except Norway, which has a higher average CSAD and standard deviation. This finding leads us to test whether countries of the same group have similar kinds of herd behavior. Among the PIIGS countries, Greece and Ireland have higher average CSAD values compared to Italy, Portugal and Spain, suggesting that the former countries might have herding given asymmetric market conditions.

4. Empirical Results

This section presents the main results for testing hypotheses '$\mathbf{H_{01}}$-$\mathbf{H_{04}}$'. Table 2 reports the estimates of the benchmark model (Eq. 3) for each market in the sample for the period of January 2001 – February 2012. The results show significantly positive coefficients on the linear term $|R_{m,t}|$ for all countries, which confirms that the cross-sectional absolute dispersion (CSAD) of returns increases with the magnitude of the market return. When analyzing coefficient γ_2 for the squared market return, the results indicate that the coefficient is significantly negative for Denmark, Finland, Sweden, Greece and Portugal reject the null

Eurozone crisis. However, our data point ends on the 16th February, 2012; therefore, we consider EZC as 02 May 2010-16 February 2012.

hypothesis of no difference in herd behavior among the country groups during the entire sample period ($\mathbf{H_{01}}$). These results suggest that the measure of dispersion increases at a decreasing rate under extreme market conditions, implying the presence of herding effects in these markets. In addition, we do not observe any herding effect for the continental European countries during the entire sample period; thus, accept the alternative hypothesis only for the continental group that similar country group has similar herding behaviour. But at the same time, Norway from Nordic group and Italy, Ireland and Spain from the PIIGS group suggest different herding behavior. Hence, herd behaviors among the country groups may differ, but we observe a similar herd behavior in a selected sample from continental Europe (French, Germany), Nordic (e.g. Denmark, Finland and Sweden), and PIIGS (e.g. Greece and Portugal).

[Insert Table 2 about to be here]

We used three sub-hypotheses ($\mathbf{H_{02a}}$**,** $\mathbf{H_{02b}}$**, and** $\mathbf{H_{02c}}$) to test $\mathbf{H_{02}}$. This hypothesis investigates the herd behavior around regime shifts and market asymmetry. The results are presented in Tables 3-5. Table 3 reports the regression estimates of herd behavior with positive and negative market returns (Eq. 4). The empirical analysis reports an asymmetric effect of cross-sectional returns dispersion in the case of France, Germany, Sweden, Ireland, Portugal and Spain, which means that herding is more evident during days of negative market returns. Moreover, for robustness checking, we use the Wald test,[8] which also suggest that the null of no difference in herding coefficients between positive and negative returns is rejected. On the other hand, we did not find any herding effect with asymmetric market returns in most

[8] We use the Wald test as a robustness checking for the herding coefficient between positive and negative returns, high and low volumes and volatility.

of the Nordic market like Denmark, Finland and Norway with positive significant γ coefficients. This is same applies to Greece market from the PIIGS group.

[Insert Tables 3 about to be here]

Further, Table 4 presents the regression estimates of herd behavior on days of high and low trading volumes (Eq. 5). We find that the trading volume asymmetrically affects the cross-sectional dispersion of returns only in the case of Norway from the Nordic sample and Greece, Italy and Ireland from the PIIGS sample. Moreover, in the case of Finland, herding effects are present but equally likely to be found in both high- and low-trading-volume conditions. This finding is confirmed by the results of the Wald test, which reject the hypothesis of equality of herding coefficients in the case of Norway and in Greece, Italy and Ireland from the other group. In contrast, we did not find any herding effect in time of market condition of high volume in Denmark, Finland and France.

[Insert Table 4 about to be here]

In addition, Table 5 presents the regression estimates of herd behavior with high and low volatility, which rejects the alternative hypothesis of equality of herding coefficients in some countries. Significant herding was found in times of high volatility in Nordic markets like Denmark and Sweden and in Greece and Ireland among the PIIGS markets. We do not find any herding effect in times of market volatility in Finland, France, Germany and Norway, where we observe herding effect either for asymmetric returns and volume. In short, we find that the herd behavior differs among different market conditions and within different groups of market, which support the alternative hypothesis.

[Insert Tables 5 about to be here]

In brief, we observe that the continental European countries, herd behavior exist only in case of negative returns period, the same is true for Sweden from the Nordic group. We also find that the Norway, the country from Nordic group herding exist in case of only high volume

market conditions whereas in Finland herd behavior is more severe that exist both in high and low volume market conditions. The same is applicable for the PIIGS country group like Greece, Italy and Ireland. Finally, we also report evidence of existence of herd behavior in Nordic (Finland, Sweden) as well as in the PIIGS country group (Greece and Ireland).

Table 6 reports the regression estimates of cross-country herd behavior. The regression results show whether the cross-sectional dispersion in each market is affected by the measure of dispersion in the other markets. The regression results indicate that 77 country coefficients are statistically significant out of 110 cross-country coefficients, which means that common herding forces exist across a great number of markets in Europe. We find that there is a strong connection among the countries within each group rejects the null hypothesis that there is no cross country herding among the similar country groups. The lowest adjusted R^2 refers that contagion effect is less pronounced in the markets of Nordic countries (average 16%), compared to the continental (31%) and PIIGS (23%) countries. The results indicate a strong relationship between the continental and PIIGS countries either with France or Germany. By contrast, there are weak relationships between Nordic and PIIGS markets, such as Greece-Denmark, Italy-Denmark, Denmark-Ireland, Portugal-Denmark, Italy-Sweden, Ireland-Finland, Sweden-Spain, Denmark-Spain, Finland-Spain and Spain-Norway. However, majority of the PIIGS markets cross country herding results accept the alternative hypothesis that similar groups of markets are highly correlated. The highest adjusted R^2 is in France (35%) followed by Ireland (28%), Germany (27%), Greece (25%) and Italy (23%). However, the EZC may contaminate different country groups because the results also produce a few exceptional strong relationships between Denmark-Italy, Ireland-France, and Portugal-Finland, which partially disregards the above hypothesis. This finding could be due to the contagion effect between the country groups in our sample.

[Insert Table 6 about to be here]

Table 7 reports the estimates for the augmented benchmark model (Eq. 8). For countries like France, Germany, Italy and Spain, there was no presence of herding under the benchmark model (Eq. 3); however, in the augmented benchmark model (Eq.8), the dispersion of returns is significantly and negatively affected by the GFC period. The subprime GFC has an impact on the herding behavior of the continental Europe (France and Germany) also support the findings from our second hypothesis of herding exist in these markets during negative returns. We evidence herd behavior during GFC in the Nordic market like Finland and Norway where the cross-sectional dispersion of return further decreased during the crisis. We also find significant herd behavior during GFC in Italy, Greece and Spain among the PIIGS markets. Finally, during the Eurozone crisis period, the countries characterized by the presence of herd behavior include Finland, Norway, Denmark, and Sweden from the Nordic markets and only Portugal from the PIIGS markets. Interestingly, the coefficients of herding behavior for the continental Europe both in France and Germany, especially in France it becomes highly significant at 1% level. In short, the GFC intensify the herding behavior in the PIIGS and continental Europe and EZC intensify the herd behavior both in the continental and Nordic European countries like Germany, France, The Nordic countries markets are primarily affected during the EZC, but continental and PIIGS are primarily affected during the GFC.

[Insert Table 7 about here]

Our study differs from Chiang and Zheng (2010) and Economou et al. (2011) in two ways. Firstly, we include continental Europe, the Nordic countries and the PIIGS in our sample. By contrast, Chiang and Zheng (2010) cover only three European markets (France, Germany and the UK) and Economou et al. (2011) consider only four Southern European (the PIGS) markets in their sample. Moreover, the sample period ends in 2008 for Chiang and Zheng (2010) and in 2009 for Economou et al. (2010). Neither of these studies focuses on the cross-

country herding effect during the EZC, whereas we capture the EZC in our study. Secondly, we mainly focus on the comparative analysis of herding in the European stock markets. In contrast, Chiang and Zheng (2010) analyzed herd behavior among globally selected markets, with little attention to Europe, and Economou et al. (2011) analyzed herd behavior with the selected European (the PIGS) countries only. Our findings[9] on the continental European sample, which include firm-level data, do not support the findings of Chiang and Zheng (2010), who consider industry indices. They report the ongoing presence of herd behavior in France, Germany and the UK. We find evidence of herd behavior in those countries only during the crisis and considering market asymmetry of negative returns. However, our study supports their view that herding effects are present in the developed markets despite the fact that we have a different sample. Further, our study supports the finding of Economou et al. (2011) that herd behavior is more prominent during crises (GFC) in the PIGS countries, but they did not find herd behavior significant in Spain. We differ in that regard; we found herding is significant in Spain when considering asymmetric market conditions for negative returns. This finding might be due to the result for $\mathbf{H_{03}}$ that there is a high cross-country correlation of dispersion of returns between Greece-Spain and Italy-Spain. Our study supports the findings of Economou et al. (2011) and Holmes et al. (2013) that the herd behavior persists in Portugal. Our study supports the findings of Economou et al. (2011) and Holmes et al. (2013) that the herd behavior persists in Portugal. Our study is different from Chiang and Chang (2010) and Economou et al. (2011) in that we investigate the cross-country herding among developed Europe during the GFC and EZC whereas neither of these studies fully captures GFC and EZC. Nevertheless, from the point of view of herd behavior synchronizations around crises (the GFC and

[9] We also try with value-weighted data and additionally include US lagged market returns as a global factor in the regression estimates, but the results do not change significantly.

EZC) in the European stock market landscape, our evidence provides better understanding of market characteristics across countries and regions around Europe.

5. Conclusion:

This paper investigates the herd behavior among European markets (e.g. continental, Nordic and the PIIGS) including the GFC and EZC. The comparative country-wise analysis of herd behavior among European countries suggests that herding is not limited to emerging Europe; it also exits in developed Europe. The empirical analysis for the entire sample period disregarding market asymmetry provides evidence of the persistence of herd behavior in the Nordic countries, like Finland, Denmark, and Sweden, and the PIIGS countries, like Portugal and Greece. The herd behaviors among country groups vary in different regimes of extreme market conditions and affect continental Europe, like Germany and France, and especially the PIIGS countries. The study concludes that common herding forces exist across a large number of markets in Europe, and they are highly related among similar types of markets. The cross-country herding effect is less pronounced in the markets of Nordic countries, like Denmark and Finland. However, the cross-country herd behavior provides evidence that continental Europe is highly related to the PIIGS, which are infected by the sovereign risk.

The high degree of co-movement in the cross-sectional returns dispersion among the countries reduces the potential for portfolio diversification benefits. An interesting finding of the study is that herd behavior in the European stock markets is that the continental and PIIGS markets are more intensely affected by the GFC and Nordic markets are affected by the Eurozone crisis (EZC) than the global crisis (GFC). This might be the outcome of bailout policy and capital injection in the PIIGS markets during EZC. The policy makers of the European Union need to consider the challenge of financial instability and the contagion effect of the PIIGS on developed European markets (continental Europe and Nordic). The convergence of trading strategies has important implications for stock market efficiency

because herding might systematically misprice financial assets and lead to the creation of asset bubbles. Market regulators and policy makers should express concerns regarding this type of collective behavior because it is said to spur unnecessary volatility, which destabilizes markets and increases the fragility of financial systems.

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Table 1: Descriptive Statistics

This table presents the summary statistics of country-wise daily cross-sectional absolute deviation of returns (CSAD) and market returns (R_m).

	Panel A: Continental and Nordic Europe											
	Denmark		Finland		France		Germany		Norway		Sweden	
	CSAD	*Rm*	*CSAD*	*Rm*	*CSAD*	*Rm*	*CSAD*	*Rm*	*CSAD*	*Rm*	*CSAD*	*Rm*
Mean	0.5071	0.0160	0.5011	0.0210	0.4562	-0.0107	0.5030	0.0023	0.8361	0.0096	0.5462	0.0216
Median	0.3812	0.0146	0.3833	0.0421	0.3373	0.0252	0.3718	0.0620	0.6306	0.0736	0.4032	0.0152
Maximum	4.2064	9.2530	4.1755	8.9196	3.9149	10.6939	5.2174	11.7858	7.5257	11.9401	4.2335	9.7813
Minimum	0.0002	-10.4517	0.0001	-8.9511	0.0012	-9.9106	0.0000	-8.3970	0.0012	-11.7175	0.0003	-8.0690
Std.dev.	0.4778	1.2951	0.4584	1.4323	0.4448	1.5883	0.4818	1.4635	0.8073	1.8768	0.5219	1.5842
N	2904	2904	2904	2904	2904	2904	2904	2904	2904	2904	2904	2904

	Panel B:PIIGS (Portugal, Italy, Ireland, Greece, Spain)									
	Greece		Italy		Ireland		Portugal		Spain	
	CSAD	*Rm*	*CSAD*	*Rm*	*CSAD*	*Rm*	*CSAD*	*Rm*	*CSAD*	*Rm*
Mean	0.7904	-0.0457	0.4020	-0.0140	0.7125	-0.0139	0.5558	-0.0172	0.4202	0.0122
Median	0.5699	0.0000	0.2984	0.0454	0.5326	0.0257	0.4296	0.0343	0.3257	0.0513
Maximum	8.7275	12.6429	3.0621	9.5408	6.7816	6.6998	3.6734	11.3263	3.4979	10.0526
Minimum	0.0001	-13.1729	0.0000	-7.6251	0.0000	-9.1757	0.0001	-9.2536	0.0000	-7.8267
Std.dev.	0.7888	1.5739	0.3841	1.3382	0.6756	1.1077	0.4987	1.1252	0.3814	1.3146
N	2904	2904	2904	2904	2904	2904	2904	2904	2904	2904

Notes: This table reports descriptive statistics for the measure of daily cross-sectional absolute deviation (CSAD) of individual stock returns with respect to the market portfolio return and the market return (Rm) for the Danish, Finish, French, German, Norwegian, Swedish, Greek, Italian, Irish, Portuguese, and Spanish market during the period January 2001–February 2012. The CSAD measure is defined in Eq (2).

Table 2: Regression Results for Herding Behavior
This table presents the regression results for the herding behavior in the full sample period. This regression tests H_{01}.

	Panel A: Continenetal and Nordic Europe					
	Denmark	Finland	France	Germany	Norway	Sweden
Constant	0,3712 ***	0,3413 ***	0,2696 ***	0,3537 ***	0,6274 ***	0,3641 ***
	(26.09)	(25.36)	(21.93)	(25.56)	(26.50)	(23.85)
$\lvert R_{m,t} \rvert$	0,1863 ***	0,2269 ***	0,2335 ***	0,1702 ***	0,2330 ***	0,2534 ***
	(9.03)	(-11.63)	(13.09)	(8.48)	(6.78)	(11.44)
$R^2_{m,t}$	-0,0102 **	-0,0165 ***	-0,0012	0,0086 *	0,0147 *	-0,0158 ***
	(-2.21)	(-3.79)	(-0.30)	(1.91)	(1.92)	(-3.20)
R^2 adj.	0,0718	0,0983	0,1999	0,1365	0,0992	0,1040

	Panel B: PIIGS (Portugal, Italy, Ireland, Greece, Spain)				
	Greece	Italy	Ireland	Portugal	Spain
Constant	0,5532 ***	0,2943 ***	0,4426 ***	0,3456 ***	0,3144 ***
	(23.57)	(26.18)	(23.95)	(24.76)	(28.04)
$\lvert R_{m,t} \rvert$	0,3363 ***	0,1270 ***	0,3140 ***	0,2750 ***	0,1278 ***
	(9.88)	(7.78)	(11.71)	(13.58)	(7.86)
$R^2_{m,t}$	-0,0241 ***	0,0038	0,0118 **	-0,0083 *	0,0019
	(-3.18)	(1.04)	(1.97)	(-1.83)	(0.52)
R^2 adj.	0,0733	0,1032	0,2165	0,1795	0,0949

Notes : This table reports the estimated coefficients for the benchmark model described in Eq(3). The sample period is January 2001–February 2012. t-Statistics are given in parentheses, where ***, ** and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3: Results of regression Estimates of herding behavior in rising and declining market (positive and negative returns) for testing $H0_{2a}$.

	Panel A: Continental and Nordic Europe					
	Denmark	Finland	France	Germany	Norway	Sweden
Constant	0,3713 ***	0,3398 ***	0,2682 ***	0,3558 ***	0,6304 ***	0,3605 ***
	(26.04)	(25.22)	(21.81)	(25.80)	(26.58)	(23.72)
D[up] | $R_{m,t}$ |	0,1783 ***	0,2281 ***	0,2258 ***	0,1011 ***	0,2181 ***	0,2454 ***
	(7.23)	(9.79)	(10.62)	(4.24)	(5.31)	(9.34)
(1-D[up]) | $R_{m,t}$ |	0,1948 ***	0,2307 ***	0,2471 ***	0,2408 ***	0,2397 ***	0,2748 ***
	(7.99)	(10.02)	(11.75)	(10.21)	(5.91)	(10.57)
D[up]$R^2_{m,t}$	-0,0074	-0,0109 *	0,0079	0,0294 ***	0,0091	0,0022
	(-1.23)	(-1.94)	(1.53)	(5.11)	(0.92)	(0.34)
(1-D[up])$R^2_{m,t}$	-0,0130 **	-0,0216 ***	-0,0098 *	-0,0124 **	0,0196 **	-0,0327 ***
	(-2.19)	(-3.84)	(-1.92)	(-2.15)	(1.99)	(-5.17)
R^2 adj.	0,0713	0,0997	0,2030	0,1460	0,1003	0,1159
	Wald tests for equality of herding coefficients					
γ1 - γ2	-0,0165	-0,0027	-0,0212	-0,1397	-0,0216	-0,0294
Chi-Square	(0.39)	(0.01)	(0.87)	(29.98) ***	(0.24)	(1.09)
H0: γ1=γ2						
γ3 - γ4	0,0056	0,0106	0,0177	0,0418	-0,0105	0,0349
Chi-Square	(0.56)	(2.22)	(7.42) ***	(32.92) ***	(0.70)	(18.91) ***
H0: γ3=γ4						

	Panel B: PIIGS (Portugal, Italy, Ireland, Greece, Spain)				
	Greece	Italy	Ireland	Portugal	Spain
Constant	0,5520 ***	0,2962 ***	0,4390 ***	0,3459 ***	0,3157 ***
	(23.47)	(26.32)	(23.85)	(24.80)	(28.14)
D[up] | $R_{m,t}$ |	0,3378 ***	0,1016 ***	0,2924 ***	0,2339 ***	0,0926 ***
	(8.30)	(5.22)	(9.19)	(9.70)	(4.77)
(1-D[up]) | $R_{m,t}$ |	0,3388 ***	0,1487 ***	0,3510 ***	0,3205 ***	0,1630 ***
	(8.42)	(7.73)	(11.15)	(13.44)	(8.50)
D[up]$R^2_{m,t}$	-0,0199 **	0,0066	0,0356 ***	0,0081	0,0115 **
	(-2.02)	(1.40)	(4.63)	(1.40)	(2.46)
(1-D[up])$R^2_{m,t}$	-0,0281 ***	0,0006	-0,0109	-0,0244 ***	-0,0079 *
	(-2.87)	(0.12)	(-1.42)	(-4.21)	(-1.68)
R^2 adj.	0,0731	0,1049	0,2266	0,1845	0,0980
	Wald tests for equality of herding coefficients				
γ1 - γ2	-0,0010	-0,0471	-0,0586	-0,0866	-0,0704
Chi-Square	(0.00)	(5.12) **	(2.96) *	(11.25) ***	(11.50) ***
H0: γ1=γ2					
γ3 - γ4	0,0082	0,0060	0,0465	0,0326	0,0194
Chi-Square	(0.43)	(1.02)	(22.86) ***	(19.55) ***	(10.74) ***
H0: γ3=γ4					

Notes: This table reports the estimated coefficients for the model described in Eq(4). The sample period is January 2001–February 2012. t-Statistics are given in parentheses, where ***, ** and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4: Results of regression estimates of herding behavior on days of high and low trading volume for testing $H0_{2(b)}$

	Panel A: Continenetal and Nordic Europé					
	Denmark	Finland	France	Germany	Norway	Sweden
Constant	0,3737 ***	0,3415 ***	0,2701 ***	0,3532 ***	0,6476 ***	0,3665 ***
	(25.98)	(25.11)	(21.73)	(25.25)	(27.22)	(23.77)
D[Vol-High] | $R_{m,t}$ |	0,1983 ***	0,2323 ***	0,2241 ***	0,1717 ***	0,2609 ***	0,2780 ***
	(8.67)	(10.74)	(11.34)	(7.72)	(6.89)	(11.33)
(1-D[Vol-High]) | $R_{m,t}$ |	0,1606 ***	0,2211 ***	0,2392 ***	0,1708 ***	0,0797 *	0,2144 ***
	(5.69)	(8.30)	(9.82)	(6.23)	(1.71)	(7.09)
D[Vol-High]$R^2_{m,t}$	-0,0130 **	-0,0171 ***	-0,0005	0,0086 *	-0,0019	-0,0202 ***
	(-2.57)	(-3.58)	(-0.11)	(1.74)	(-0.23)	(-3.73)
(1-D[Vol-High])$R^2_{m,t}$	-0,0029	-0,0163 **	0,0007	0,0075	0,0815 ***	-0,0079
	(-0.35)	(-2.10)	(0.09)	(0.94)	(6.00)	(-0.90)
R^2 adj.	0,0717	0,0978	0,1999	0,1360	0,1097	0,1051
	Wald tests for equality of herding coefficients					
γ1 - γ2	0,0377	0,0112	-0,0151	0,0009	0,1812	0,0636
Chi-Square	(1.85)	(0.18)	(0.40)	(0.0012)	(15.60) ***	(4.58) **
H0: γ1=γ2						
γ3 - γ4	-0,0101	-0,0008	-0,0012	0,0011	-0,0834	-0,0123
Chi-Square	(1.34)	(0.0096)	(0.024)	(0.016)	(33.37) ***	(1.73)
H0: γ3=γ4						

	Panel B: PIIGS (Portugal, Italy, Ireland, Greece, Spain)				
	Greece	Italy	Ireland	Portugal	Spain
Constant	0,5603 ***	0,2972 ***	0,4544 ***	0,3475 ***	0,3140 ***
	(23.64)	(26.16)	(24.44)	(24.64)	(27.78)
D[Vol-High] | $R_{m,t}$ |	0,3273 ***	0,1364 ***	0,3018 ***	0,2943 ***	0,1380 ***
	(8.68)	(7.55)	(10.21)	(13.12)	(7.68)
(1-D[Vol-High]) | $R_{m,t}$ |	0,2999 ***	0,0997 ***	0,2522 ***	0,2439 ***	0,1167 ***
	(6.46)	(4.48)	(6.92)	(8.83)	(5.27)
D[Vol-High]$R^2_{m,t}$	-0,0280 ***	0,0008	0,0053	-0,0118 **	0,0005
	(-3.35)	(0.19)	(0.81)	(-2.37)	(0.13)
(1-D[Vol-High])$R^2_{m,t}$	-0,0001	0,0133 **	0,0510 ***	-0,0018	0,0029
	(-0.007)	(2.05)	(4.80)	(-0.22)	(0.45)
R^2 adj.	0,0750	0,1036	0,2240	0,1801	0,0957
	Wald tests for equality of herding coefficients				
γ1 - γ2	0,0274	0,0367	0,0496	0,0504	0,0213
Chi-Square	(0.36)	(2.81) *	(1.92)	(3.43) *	(0.95)
H0: γ1=γ2					
γ3 - γ4	-0,0279	-0,0125	-0,0457	-0,0100	-0,0024
Chi-Square	(3.75) *	(3.30) *	(16.39) ***	(1.37)	(0.13)
H0: γ3=γ4					

Notes: This table reports the estimated coefficients for the model described in Eq(5). The sample period is January 2001—February 2012. t-Statistics are given in parentheses, where ***, ** and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5: Results of regression estimates of herding behavior on days of high and low volatility for testing $H0_{2(c)}$

	Panel A: Continenetal and Nordic Europé					
	Denmark	Finland	France	Germany	Norway	Sweden
Constant	0,3689 ***	0,3418 ***	0,2684 ***	0,3530 ***	0,6242 ***	0,3610 ***
	(25.79)	(25.24)	(21.69)	(25.39)	(26.20)	(23.51)
$D[\sigma 2\text{-High}] \mid R_{m,t} \mid$	0,2479 ***	0,2272 ***	0,2427 ***	0,2143 ***	0,2871 ***	0,2889 ***
	(7.65)	(7.40)	(8.65)	(6.80)	(5.32)	(8.30)
$(1\text{-}D[\sigma 2\text{-High}]) \mid R_{m,t} \mid$	0,1688 ***	0,2252 ***	0,2345 ***	0,1527 ***	0,2222 ***	0,2501 ***
	(7.77)	(10.96)	(12.48)	(7.23)	(6.14)	(10.73)
$D[\sigma 2\text{-High}]R^2_{m,t}$	-0,0249 ***	-0,0149 *	-0,0075	0,0038	-0,0030	-0,0317 ***
	(-2.63)	(-1.66)	(-0.91)	(0.41)	(-0.19)	(-3.11)
$(1\text{-}D[\sigma 2\text{-High}])R^2_{m,t}$	-0,0066	-0,0165 ***	-0,0004	0,0107 **	0,0182 **	-0,0132 **
	(-1.36)	(-3.60)	(-0.092)	(2.27)	(2.25)	(-2.54)
R^2 adj.	0,0733	0,0977	0,1997	0,1383	0,0992	0,1045
	Wald tests for equality of herding coefficients					
$\gamma 1 - \gamma 2$	0,0791	0,0020	0,0082	0,0615	0,0650	0,0388
Chi-Square	(6.48) **	(0.005)	(0.092)	(4.15) **	(1.58)	(1.35)
H0: $\gamma 1 = \gamma 2$						
$\gamma 3 - \gamma 4$	-0,0183	0,0016	-0,0071	-0,0069	-0,0212	-0,0184
Chi-Square	(3.49) *	(0.032)	(0.70)	(0.52)	(1.68)	(3.06) *
H0: $\gamma 3 = \gamma 4$						

	Panel B: PIIGS (Portugal, Italy, Ireland, Greece, Spain)				
	Greece	Italy	Ireland	Portugal	Spain
Constant	0,5485 ***	0,2943 ***	0,4330 ***	0,3452 ***	0,3121 ***
	(23.24)	(26.02)	(23.41)	(24.59)	(27.80)
$D[\sigma 2\text{-High}] \mid R_{m,t} \mid$	0,3965 ***	0,1393 ***	0,3921 ***	0,3124 ***	0,1844 ***
	(7.41)	(5.43)	(9.35)	(9.82)	(7.24)
$(1\text{-}D[\sigma 2\text{-High}]) \mid R_{m,t} \mid$	0,3287 ***	0,1214 ***	0,3195 ***	0,2596 ***	0,1091 ***
	(9.17)	(7.07)	(11.38)	(12.18)	(6.40)
$D[\sigma 2\text{-High}]R^2_{m,t}$	-0,0489 ***	0,0032	-0,0374 ***	-0,0116	-0,0077
	(-3.13)	(0.42)	(-3.05)	(-1.25)	(-1.04)
$(1\text{-}D[\sigma 2\text{-High}])R^2_{m,t}$	-0,0199 **	0,0043	0,0184 ***	-0,0065	0,0048
	(-2.49)	(1.13)	(2.94)	(-1.36)	(1.27)
R^2 adj.	0,0737	0,1030	0,2247	0,1808	0,0992
	Wald tests for equality of herding coefficients				
$\gamma 1 - \gamma 2$	0,0678	0,0180	0,0726	0,0528	0,0753
Chi-Square	(1.75)	(0.53)	(3.26) *	(3.003) *	(9.53) ***
H0: $\gamma 1 = \gamma 2$					
$\gamma 3 - \gamma 4$	-0,0290	-0,0012	-0,0558	-0,0051	-0,0125
Chi-Square	(3.22) *	(0.023)	(19.34) ***	(0.28)	(2.66)
H0: $\gamma 3 = \gamma 4$					

Notes: This table reports the estimated coefficients for the model described in Eq(6). The sample period is January 2001–February 2012. t-Statistics are given in parentheses, where ***, ** and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6: Results of regression estimates of cross-country herding behavior for testing H_{03}

	Panel A: Continenetal and Nordic Europé						*Panel B: PIIGS (Portugal, Italy, Ireland, Greece, Spain)*				
	Denmark	Finland	France	Germany	Norway	Sweden	Greece	Italy	Ireland	Portugal	Spain
Constant	0,1896 ***	0,1467 ***	0,0359 **	0,0957 ***	0,3513 ***	0,1103 ***	0,0665 **	0,0870 ***	0,1930 ***	0,2208 ***	0,1583 ***
	(9.81)	(8.10)	(2.28)	(5.31)	(10.93)	(5.36)	(2.20)	(5.88)	(7.70)	(11.48)	(10.65)
$\lvert R_{m,t} \rvert$	0,0846 ***	0,1008 ***	0,1003 ***	0,0102	0,0761 **	0,1072 ***	0,0589 *	0,0056	0,1599 ***	0,2064 ***	0,0381 **
	(3.90)	(5.00)	(5.79)	(0.51)	(2.10)	(4.71)	(1.77)	(0.33)	(5.74)	(9.64)	(2.27)
$R^2_{m,t}$	-0,0092 **	-0,0120 ***	-0,0006	0,0099 **	0,0177 **	-0,0122 ***	-0,0213 ***	0,0055	0,0133 **	-0,0075 *	0,0038
	(-2.06)	(-2.89)	(-0.16)	(2.39)	(2.37)	(-2.60)	(-3.11)	(1.62)	(2.30)	(-1.67)	(1.09)
CSAD[Denmark]		0,0849 ***	0,0248 *	0,0665 ***	0,1351 ***	0,0852 ***	0,0102	0,0689 ***	0,0353	0,0086	0,0028
		(4.91)	(1.66)	(3.89)	(4.36)	(4.36)	(0.35)	(4.91)	(1.47)	(0.46)	(0.19)
CSAD[Finland]	0,0978 ***		0,0557 ***	0,0255	0,0041	0,1345 ***	0,2132 ***	0,0024	0,0630 **	0,0832 ***	0,0225
	(4.91)		(3.48)	(1.38)	(0.12)	(6.45)	(7.02)	(0.16)	(2.45)	(4.17)	(1.46)
CSAD[France]	0,0385 *	0,0750 ***		0,2696 ***	-0,0219	0,0629 ***	0,3097 ***	0,1124 ***	0,2357 **	0,0042	-0,0070
	(1.66)	(3.48)		(12.99)	(-0.56)	(2.58)	(8.83)	(6.44)	(7.97)	(0.17)	(-0.39)
CSAD[Germany]	0,0784 ***	0,0261	0,2046 ***		0,1986 ***	0,0231	0,1362 ***	0,0380 **	0,0921 ***	0,0384 **	0,0707 ***
	(3.89)	(1.38)	(12.99)		(5.92)	(1.08)	(4.41)	(2.49)	(3.54)	(1.90)	(4.55)
CSAD[Norway]	0,0485 ***	0,0013	-0,0050	0,0604 ***		0,0611 ***	0,0469 ***	0,0297 ***	0,0245 *	0,0213 *	-0,0053
	(4.36)	(0.12)	(-0.56)	(5.92)		(5.24)	(2.75)	(3.52)	(1.70)	(1.91)	(-0.61)
CSAD[Sweden]	0,0770 ***	0,1055 ***	0,0366 ***	0,0177	0,1539 ***		0,1609 ***	0,0169	0,0608 ***	0,0466 ***	0,0437
	(4.36)	(6.45)	(2.58)	(1.08)	(5.24)		(5.97)	(1.26)	(2.67)	(2.63)	(3.21)
CSAD[Greece]	0,0043	0,0787 ***	0,0848 ***	0,0492 ***	0,0557 ***	0,0758 ***		0,0701 ***	0,0067	-0,0028	0,0837 ***
	(0.35)	(7.02)	(8.83)	(4.41)	(2.75)	(5.97)		(7.70)	(0.43)	(-0.23)	(9.07)
CSAD[Italy]	0,1202 ***	0,0037	0,1261 ***	0,0563 **	0,1443 ***	0,0327	0,2872 ***		0,1081 ***	0,0727 ***	0,1403 ***
	(4.91)	(0.16)	(6.44)	(2.49)	(3.52)	(1.26)	(7.70)		(3.42)	(2.95)	(7.47)
CSAD[Ireland]	0,0212	0,0329 **	0,0913 ***	0,0470 ***	0,0411 *	0,0405 ***	0,0095	0,0373 ***		0,0304 **	0,0323 ***
	(1.47)	(2.45)	(7.97)	(3.54)	(1.70)	(2.67)	(0.43)	(3.42)		(2.10)	(2.90)
CSAD[Portugal]	0,0086	0,0720 ***	0,0027	0,0325 *	0,0593 *	0,0515 ***	-0,0066	0,0416 ***	0,0504 **		0,0280 **
	(0.46)	(4.17)	(0.17)	(1.90)	(1.91)	(2.63)	(-0.23)	(2.95)	(2.10)		(1.95)
CSAD[Spain]	0,0048	0,0329	-0,0076	0,1009 ***	-0,0247	0,0813 ***	0,3308 ***	0,1353 ***	0,0903 ***	0,0472 *	
	(0.19)	(1.46)	(-0.39)	(4.55)	(-0.61)	(3.21)	(9.07)	(7.47)	(2.90)	(1.95)	
R^2 adj.	0,1347	0,1844	0,3573	0,2781	0,1555	0,1972	0,2539	0,2318	0,2811	0,2035	0,1923

Notes: This table reports the estimated coefficients for the model described in Eq(7). The sample period is January 2001–February 2012. t-Statistics are given in parentheses, where ***, ** and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: Results of regression estimates of herding behavior for the GFC and ERC to test H_{04}

Panel A: Herding Behavior during GFC											
	The PIIGS countries					Continental and Nordic countries					
	Portugal	Italy	Ireland	Greece	Spain	Finland	Norway	Sweden	Denmark	France	Germany
|Rm,t|	.2419*** (11.34)	.0924 (5.16)	.3120*** (11.21)	.2963 (6.93)	.0976*** (5.61)	.2066 (10.16)	.2862 (8.07)	.2357*** (10.70)	0.0557*** (8.00)	.1929** (10.56)	.1357*** (6.56)
R^2m,t	.0007 (0.10)	.0193*** (3.55)	.0165** (1.94)	-.0087 (-0.67)	.0142*** (2.68)	-.0089 (-1.43)	-.0256** (-2.37)	-.0144** (-2.15)	-.0103* (-1.57)	.0104* (1.87)	.0182*** (2.90)
D[Crisis]R^2m,t	-.0064 (-1.37)	-.0155*** (-3.94)	-.0064 (-1.06)	-.0200** (-2.12)	-.0118*** (-3.09)	-.0073* (-1.64)	.0430*** (5.50)	.0022 (0.46)	.0028 (0.60)	-.0084** (-2.08)	-.0074* (-1.62)
Constant	.3847*** (28.26)	.3474*** (30.37)	.4613*** (25.97)	.7169*** (26.29)	.3620*** (32.61)	.3714*** (28.61)	.6512*** (28.77)	.3804*** (27.07)	.4090*** (29.75)	.3099*** (26.59)	.3892*** (29.49)
R^2 adj.	0.1410	0.0744	0.1919	0.0383	0.0703	0.0798	0.0914	0.0918	0.0557	0.1628	0.1072
F stat	188.30***	92.68***	272.04***	46.40***	87.31***	99.89***	115.78***	116.35***	68.28***	222.92***	137.95***
N	3424	3424	3424	3424	3424	3424	3424	3424	3424	3424	3424
Panel B: Herding Behavior during EZC											
	The PIIGS countries					Continental and Nordic countries					
	Portugal	Italy	Ireland	Greece	Spain	Finland	Norway	Sweden	Denmark	France	Germany
|Rm,t|	.2554*** (12.67)	.1144*** (6.74)	.3219*** (12.23)	.3229*** (7.99)	.1145*** (6.95)	.2160*** (11.22)	.2427*** (7.27)	.2397*** (11.54)	.1708*** (8.39)	.2096*** (12.15)	. 1496*** (7.65)
R^2m,t	-.0042 (-0.91)	.0034 (0.88)	.0102* (1.69)	-.0298*** (-3.22)	.0022 (0.58)	-.0168*** (-3.81)	.0251*** (3.29)	-.0094** (-1.97)	-.0064 (-1.38)	.0038 (0.95)	.0120*** (2.69)
D[Crisis]R^2m,t	-.0116** (-2.20)	.0050 (1.13)	-.0005 (-0.07)	.0112 (1.06)	.0033 (0.76)	-.0168*** (-3.81)	-.0668*** (-7.65)	-.0226*** (-4.17)	-.0084* (-1.57)	-.0125*** (-2.77)	-.0082* (-1.61)
Constant	.3802** (28.23)	.3413*** (30.08)	.4584*** (26.07)	.7097 (26.27)	.3573*** (32.46)	.0053*** (1.06)	.6608*** (29.61)	.3783*** (27.26)	.4091*** (30.07)	.3045*** (26.41)	.3848*** (29.46)
R^2 adj.	0.1417	0.0705	0.1917	0.0373	0.0679	0.0793	0.0988	0.0963	0.0563	0.1636	0.1072
F stat	189.44***	87.56***	271.58***	45.23***	84.10***	99.33***	126.07***	122.65***	69.03***	224.25***	137.94***
N	3424	3424	3424	3424	3424	3424	3424	3424	3424	3424	3424

Notes: This table reports the estimated coefficients for the model described in Eq(8). The sample period is January 2001–February 2012. The GFC is defined as 09 August 2007-31 December 2009. The EZC is defined as 02 May 2010-16 February 2012. The t-Statistics are given in parentheses, where ***, ** and * represent statistical significance at the 1%, 5%, and 10% level, respectively.