Herding Behavior in the Chinese Stock Market. A Comparative Analysis with Other BRICS Countries.

Abstract

The presence of herding behavior undermines the hypothesis of market efficiency, which requires the complete rationality and the possession of the same information for all individuals. This paper brings new empirical evidence in order to verify the presence of gregarious behavior in the China stock market using a 20 year-long time series. The paper differs from previous studies in several aspects. First, given the limited number of contributions focused on the Chinese stock market in relationship to the importance of its economy on a global level, the paper seeks to bridge the gap that currently exists. Then, this study not only tests the presence of herding behavior in China, but also carries out comparisons with similar countries, the so-called BRICS (Brazil, Russia, India and South Africa). Besides, we investigate the influence of the U.S. market on these emerging stock markets, and finally we examine the presence of herding behavior in bullish and bearish market conditions, and in pre- and post- financial crisis.

Our analysis does not allow to clearly identify the presence of herding behavior in the Chinese market; this anomaly is in fact more likely in markets where information are more disclosed and foreign investors are more willing and free to enter (India and South Africa). The results show the intensification of this behavioral occurrence during bear markets and extreme market conditions, reducing diversification benefits of financial portfolios accessible through investment in international markets.

Keywords: herding behavior; Chinese stock market; BRICS; CSSD; CSAD

JEL classification: G02; G14

1. Introduction

The term *herding behavior* refers to the conduct of an individual who relinquishes their own beliefs, and better judgment, to follow the decisions of the collective, even when they appear in error (Christie and Huang, 1995).

Imitative behavior can be traced back through the history of mankind: the first evidence dates back to the Iron Age, as described by Lao and Singh (2011), citing Wallace (2003); a distinguished observer of this phenomenon was Machiavelli, who, in his book "The Prince", noted that men almost always move in the footsteps of others, and advance by means of imitation, as also noted in the work of Hirshleifer and Hong Teoh (2003). The term *herding behavior* was originally used to describe the irrational behavior of the masses. Only recently have some psychologists come to believe that herding behavior is not necessarily irrational, but can also be correlated with the need to conform with others (Rook, 2006). The fear of reaching a wrong conclusion influences our decisions, and impels us to follow the herd, in the belief that a collective error may prove less damaging to an individual's reputation than a personal mistake (Caparrelli et al., 2004). As the saying goes, "a trouble shared is a trouble halved".

It is also possible to distinguish irrational, or rational, herd behavior in the financial sector. The former occurs when traders ignore the information available to them, and refuse to make their own decisions, in order to follow the conclusions of others, even if they disagree (Christie and Huang, 1995). Rational behavior, on the other hand, is manifested in situations where an individual, unable to fulfill their expectations, copies the actions of another they deem to be better informed, with better decision-making skills, in the hope of obtaining a resulting performance no lower than the market average (Chang et al., 2000, Demirer and Kutan, 2006), or a performance similar to that of their competitors, in situations where an individual is evaluated on a comparative basis, such as the case of fund managers (Cote and Goodstein, 1999).

The presence of herd behavior therefore puts the hypothesis of market efficiency at risk, as this requires access to the same information by all involved, and rational decision making. In such situations, in fact, individuals do not invest rationally, based on the information available to them, but simply follow the behavior of other parties (Nofsinger and Sias, 1999).

The study of such herd behavior therefore proves to be of interest not only for supervisors, as common negotiation schemes can threaten stability by significantly deviating the market

price of the instruments of the value of fundamentals, as the price also reflects irrational behavior (Demirer and Kutan, 2006, Hott, 2009), but also for individual investors, who see a decline in the benefit of portfolio diversification (Chang et al., 2000, Chiang and Zheng, 2010).

This paper is structured as follows: the next section summarizes the results of the main literature, while Section 3 goes on to describe the methodologies adopted and the data used in the study. Paragraph 4 illustrates the empirical evidence of the investigation carried out in order to verify the presence of herding behavior in the Chinese market, and also in comparison with other emerging countries. In closing, Section 5 contains a summary of the research, and draws some conclusions based on the results achieved, while also highlighting how the research topic could potentially be further developed.

2. Literature review

In literature, anomalies relating to the imitative behavior of investors can be investigated either in terms of the type of investor (Chang et al., 2000, Chiang et al., 2010, Liu et al., 2012), or at the level of the market as a whole. In the latter respect, several methodologies can be applied ,in order to analyze the degree of herd behavior in financial markets. A widely used technique to be found in the literature concerns the dispersion of cross-sectional correlations in the level of stock yields, in response to extreme variations in the financial markets.

Several studies have employed this technique to carry out an analysis of herd behavior in evolved markets; their results are, however, conflicting, often as a result of different methodologies employed and different research areas investigated. Christie and Huang (1995) assert that herd behavior cannot be observed in the U.S. market in phases of market stress, as price variations increase, rather than decrease, in periods of high volatility. Chang et al. (2000) also reach the same conclusion in relation to the U.S. market, although the authors adopt a different methodology; a similar argument can also be applied to countries such as Hong Kong and Japan.

Nofsinger and Sias (1999), however, demonstrate how herding behavior is can be observed in the United States, especially among institutional investors. Institutional investors, as with individual investors, are also more likely to be subject to this anomalous behavior in the Japanese market (Iihara et al., 2001). More recent studies confirm the presence of herd behavior in developed markets (with the exception of the U.S.), and in Asian markets, but evidence has

yet to be produced with regard to South American markets (Chiang and Zheng, 2010). At the European level, studies on the subject are thin on the ground. Among these, the analysis of Khan et al. (2011), based on a multifactorial model, and conducted in four countries (France, Germany, Italy and the United Kingdom), demonstrates the presence of herd behavior in all countries under analysis, especially during periods of normal market fluctuation. A study by Caparrelli et al. (2004) argues that the degree (or indeed absence) of herding behavior observed in the Italian market in the period 1988-2001 depends to a great extent on the adopted estimation model. Economou et al. (2011) also argue that, by analyzing four European markets (Greece, Italy, Portugal and Spain) in the period January 1998 - December 2008, the presence of herd behavior can be only confirmed in Greece and Italy, while is absent in Spain, and there are contrasting results in the case of Portugal.

The attention of researchers has over time turned to the analysis of herd behavior in emerging markets, on occasion in contrast with more advanced contexts. Chang et al. (2000) hold that, unlike most advanced markets, countries such as South Korea and Taiwan demonstrate the presence of herding behavior. In a recent study on the Taiwanese market, focusing on circa 700 companies, classified according to 18 different business sectors, between January 1995 and December 2006, Demirer et al. (2010) arrive at conflicting results, as a result of the different models used to verify the presence of herd behavior. Khaliliaraghi et al. (2011) analyze the Iranian market between 2006 and 2009, demonstrating the presence of such anomalies in situations of high volatility or abnormal volumes. A recently published paper (Bhaduri and Mahapatra, 2013) applies a methodology based on the dispersion of yields within a group of instruments in the Indian market, concluding that in periods of high price volatility, the variability of returns tends to decrease, confirming the presence of herding behavior in this market.

In recent years, an increasing number of studies have focused their attention on the analysis of herd behavior in the Chinese market. As is the case with other emerging economies, the Chinese market has long been considered more risky and less efficient than other, more developed financial markets, due to a lesser degree of disclosure, less sophisticated investors, and socio-cultural differences that favor collective, rather than individualistic, behavior (Chen et al., 2007).

Lao and Singh (2011) verify a more significant degree of herding behavior in the Chinese market, as compared with the Indian equivalent. Their results suggest that while herding behavior is present in both markets, it has a more profound impact in the Chinese context, and is particularly evident in the early stages of high market volatility. Tan et al. (2008) also confirm

the presence of herd behavior on the stock exchanges in Shanghai and Shenzhen. This is most notable in the Shanghai Stock Exchange A Share Index, especially in extreme market situations, and in particular if the overriding trend is positive, or characterized by high trading volumes and volatility. Chiang et al. (2010) are of the same opinion, and highlight similar behavior among investors in type A shares, as compared to those who invest in type B shares. In contrast, Demirer and Kutan (2006) do not detect any evidence of herding behavior in the Chinese market in market stress conditions. Tzewei and Monli (2010) also reach similar conclusions that, while confirming the absence of imitative behavior, demonstrate how China is still characterized by a tendency on the part of investors to emulate the behavior of others during downturns in the market, or in relation to stocks with a limited turnover.

As has been noted, the results of those studies conducted to date with the aim of verifying the presence or absence of herding behavior in the Chinese market seem therefore to remain inconclusive. This paper aims to contribute to this discussion by introducing new empirical evidence, in an effort to establish whether the presence of herding behavior can be demonstrated in the largest Asian market.

This paper differs from the work currently available in the literature in several respects. Firstly, given the limited number of contributions that focus on the Chinese market, in relation to the importance of its economy at the global level, this paper seeks to bridge a gap in the literature. Specifically, within the ambit of research that aims to verify the presence herd behavior, there remain a limited number of studies that focus exclusively on emerging markets. Even more infrequent are papers that undertake a comparative analysis across several markets, and where such studies exist, the terms of comparison are usually limited to markets characterized by geographic proximity.

This paper not only substantiates the presence of herding behavior in the Chinese market, but also carries out comparisons with similar markets, not from a geographical perspective, but in terms of potential for growth in the coming years. This comparison is made with other emerging countries, known as the BRICS, which is to say the major ascending economies, such as China, which enjoy high potential for growth. In addition to China, other countries that fall into this category include Brazil, Russia, India, and South Africa.

Furthermore, this study also adopts a number of apparently similar methodologies, which, as demonstrated in other studies present in the literature, can lead to different results. In particular, the methods used in this paper are based on cross-sectional standard deviation (Christie and Huang, 1995) and cross-sectional absolute deviation (Chang et al., 2000). These methods will be employed to verify the presence of herding behavior in different situations,

such as periods of price growth and decline, the degree of influence of the U.S., before and after the financial crisis, and market stress conditions.

3. Methodology and data

This section summarizes the data and methodologies used in this study to assess the extent of herding behavior in the Chinese market, and make appropriate comparisons with other BRICS countries.

3.1 The Cross-Sectional Standard Deviation method (CSSD)

One potential method to verify the presence (or absence) of imitative behavior is that proposed by (Christie and Huang, 1995) (hereinafter CH): the authors identify the dispersion of returns of individual stocks, as compared with the market yield, as an instrument with which to measure the extent of herd behavior.

Dispersion quantifies the average deviation of individual performance from average yields (market return). When the returns of individual securities move in line with the market, the value of dispersion is reduced; and when individual yields begin to deviate from the market return, the level of dispersion increases. The rational justification behind this methodology is the assumption that individuals, in the presence of herding behavior, have a tendency to suppress their own opinions and beliefs and make decisions based on collective action in the market. As a result, the returns on individual stocks will be less likely to deviate from overall market performance, thus generating a reduction in dispersion.

The authors suggest ascertaining the extent of herding behavior only at times when circumstances render it more likely: the tendency to imitate the behavior of others appears to be stronger during periods characterized by unusual market trends, and phases of high volatility, situations characterized by high uncertainty. In such circumstances, which also result in higher information production costs, imitative behavior makes it possible to obtain a return on investments in line with the market average. In situations where the presence of herd behavior can be verified, the level of yield dispersion will therefore be lower than normal.

In their paper, CH measure dispersion as the cross-sectional standard deviation (CSSD) of yields

$$CSSD_t = \sqrt{\frac{\sum_{R=1}^{N}(R_i - \bar{R})^2}{N-1}} \quad (1)$$

where R_i is the performance observed for the title i, and $\bar{R}$ is the cross-sectional mean of N portfolio returns. Through the calculation of the upward or downward trend in yields of individual assets, as compared with overall market performance, it is possible to determine the presence or absence of imitative behavior.

This method proposes to examine the values of dispersion (calculated as in Equation (1)) during periods of high volatility, by estimating the following linear regression:

$$CSSD_t = \alpha + \beta_1 D_t^D + \beta_2 D_t^U + \varepsilon_t \quad (2)$$

where D_t^D represents a dummy variable, with a value of 1, if the market return on day t is located in the left tail of the distribution of returns (downward phase), otherwise zero; D_t^U represents another dummy variable, with a value of 1 if the market return on day t is in the right tail of the distribution of returns (upward phase), or otherwise zero; α is a constant, and indicates the average dispersion of the sample, excluding the extreme zones of distribution; and, finally, ε_t represents an error term.

The presence of herd behavior will be verified in the result of negative values for the β_1 and β_2 coefficients: investors, taking similar decisions, will not see returns on individual titles deviate from market yields, thus reducing dispersion (the CSSD value) with respect to normal (not extreme) distribution situations. CH use percentiles of 1% and 5% to calculate the extreme tail of the distribution of yields in their work.

3.2 The Cross-Sectional Absolute Deviation method (CSAD)

Chang et al. (2000) (hereinafter CCK) propose a development of the CH model to identify the presence of herd behavior, using a new approach based on Cross-Sectional Absolute Deviation (CSAD) as a measure of the dispersion of yields. In particular, according to Chang

et al., if investors tend to follow the collective behavior of the market, in ignoring their own views during periods of great price fluctuations, then the positive linear relationship between dispersion and the market return (as in the CH model) is no longer valid, as this relationship may in fact increase in a non-linear manner, or even see a decrease in certain situations.

To demonstrate the relationship between CSAD and market return, Chang et al. use the conditioned version of the CAPM model:

$$E_t(R_i) = \gamma_0 + \beta_i E_t(R_m - \gamma_0) \quad (3)$$

where R_i and R_m are, respectively, the performance of the generic title i, and the market portfolio (consisting of all securities listed on the market, equally weighted), E_t represents the expected value at the time t, γ_0 the return of the risk-free title, and β_i the sensitivity of the title to market variations.

Using the same formula, it is possible to estimate the market yield at the time t:

$$E_t(R_m) = \gamma_0 + \beta_m E_t(R_m - \gamma_0) \quad (4)$$

The Absolute Value of Deviation (AVD) of the expected return of the title i at the time t and the expected return on the market portfolio can therefore be expressed as the difference in absolute value between (3) and (4), namely:

$$\begin{aligned} AVD_{i,t} = & \ |[\gamma_0 + \beta_i E_t(R_m - \gamma_0)] - [\gamma_0 + \beta_m E_t(R_m - \gamma_0)]| = \\ & = |\beta_i - \beta_m| E_t(R_m - \gamma_0) \end{aligned} \quad (5)$$

As a result, the expected value of the cross-sectional absolute deviation of stock returns (ECSAD) in time t can be defined:

$$ECSAD = \frac{1}{N}\sum_{i=1}^{N} \beta_i AVD_{i,t} = \frac{1}{N}\sum_{i=1}^{N} |\beta_i - \beta_m| E_t(R_m - \gamma_0) \quad (6)$$

To capture all possible non-linear relationships between the dispersion of yields of individual activities and market returns, CCK propose the introduction of an additional regression parameter, specifically to evaluate this aspect. Furthermore, given that $ECSAD_t$ and

$E_t(R_{m,t})$ are not observable, the authors use $CSAD_t$ and $R_{m,t}$ to approximate them. CCK propose the following measure of the CSAD:

$$\mathrm{CSAD} = \frac{1}{N}\sum_{i=1}^{N}\left|R_{i,t} - R_{m,t}\right| \quad (7)$$

To evaluate the additional hypothesis that herding behavior may have a different impact in situations of upward or downward market trends, CCK formulate the following model:

$$\mathrm{CSAD}_t^U = \alpha + \gamma_1^U\left|R_{m,t}^U\right|D_t^U + \gamma_2^U\left(R_{m,t}^U\right)^2 D_t^U + \varepsilon_t \quad (8)$$

$$\mathrm{CSAD}_t^D = \alpha + \gamma_1^D\left|R_{m,t}^D\right|D_t^D + \gamma_2^D\left(R_{m,t}^D\right)^2 D_t^D + \varepsilon_t \quad (9)$$

where $\left|R_{m,t}^U\right|$ and $\left|R_{m,t}^D\right|$ represent the absolute value of the return on the market portfolio at time t, when the market trend is positive or negative, D_t^L represents a dummy variable, with a value of 1, if the market return on day t is negative, otherwise zero, and D_t^U represents another dummy variable, with a value of 1 if the market return on day t is positive, zero otherwise.

In this model the presence of herd behavior is clearly established, as the coefficients γ_1 and γ_2 result as being negative, to a statistically significant extent, with γ_2 demonstrating non-linear relationships most common in extreme market conditions.

3.3 Data

Our sample includes stocks quoted on the Chinese stock market on a period of 20 years (from March 1, 1993 to March 1, 2013). We decide to include both active and dead stocks in order to eliminate any issue related to the survivorship bias. Financial market data are obtained from the Datastream; in particular we use the monthly total return time series of each stocks to calculate the periodic return.

In order to make a comparison among China and the other BRICS countries, we use the same data for Brazil, Russia, India, and South Africa. For Brazil, the starting date is 7/4/1994 and 10/20/1994 for Russia. We use also data from the US stock market to obtain a point of

reference of the largest advanced market and also to test our hypothesis of research in this country.

All our empirical evidences presented in section 4 are shown in the following order: firstly, we illustrate the results regarding China, then we show some evidences for other BRICS countries and the U.S. market.

4. Empirical results

4.1 Descriptive statistics

We estimate both measures adopted in the analysis of hearding behavior: CSSD and CSAD adopting equation (1) and equations (7). Table 1 provides a summary of main statistics. The numbers indicates that CSSD measure has a greater mean value and higher standard deviation compared with CSAD measure.

We find also higher values of both CSSD and CSAD both for China and BRICS countries, compared to the USA. An higher mean values of the indexes are signal of higher variation across the stock returns for the BRICS markets compared to the U.S. market. A higher standard deviation can be interpreted as an unusual cross-sectional variation due to the diffusion process of news or market shocks.

<< INSERT TABLE 1 HERE >>

4.2 Estimates of herding behavior

4.2.1 RESEARCH HYPOTHESIS

The first research hypothesis concerns the test of the existence of the herding behavior. We adopt the equations proposed by (Chiang and Zheng, 2010) in order to take care of the asymmetric investor behavior under different market conditions:

$$CSSD_t = \alpha + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R_{m,t}^2 + \varepsilon_t \quad (10)$$

$$CSAD_t = \alpha + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R_{m,t}^2 + \varepsilon_t \quad (11)$$

Firstly, we estimate the equation with OLS, then we impose the restriction of no constant term ($\alpha = 0$). As already mentioned above, a negative value of the coefficient γ_3 indicates the presence of herding behavior. Following Duffee (2001), the sum of the coefficients $\gamma_2 + \gamma_1$ obtained by equation (11) capture the relationship between returns dispersion and market returns when the market goes up ($R_{m,t} > 0$), while $\gamma_2 - \gamma_1$ shows the same relationship when the market goes down ($R_{m,t} < 0$). Hence, the ratio of these values $(\gamma_2 + \gamma_1)/(\gamma_2 - \gamma_1)$, can be seen as the relative amount of asymmetry between stock returns dispersion and the market's returns (hereinafter Dratio). Table 2 shows the results of the estimates in the usual order.

<< INSERT TABLE 2 HERE >>

4.2.2 Empirical evidence in China

Tabel 2, Panel 1.A and 1.B show evidences related to the Chinese market. Our findings are not unique. The values of γ_3 are significant only for the model estimates with no constant term (Panel 1.B). In this case, our results do not support the presence of herd behavior obtained by (Chiang and Zheng, 2010) and the conclusions reached by (Demirer and Kutan, 2006), who sustain that investors in the China stock markets make rational investment choices. The Dratio is equal to 0.934; the value is significantly lower than that reported by Duffee (2001) related to the U.S. market, where the ratio for NYSE/Amex/Nasdaq is around 1.4. Our findings are comparable to the results obtained by CCK (2000), who find no evidence of herding behavior in the Honk Kong market.

4.2.3 Comparative analysis with other Brics countries and U.S. market

The results regarding the BRICS countries are easier to read. All countries show in all models significant negative coefficient (Table 2, Panel 3-12), hence we can affirm the presence of herd behavior in the markets analyzed. These findings are in contrast to the results reported by (Chiang and Zheng, 2010), both for Brazil, where the authors do not find supporting evidence of herding behavior in all Latin America countries, while our results show the opposite, and for Russia, where we demonstrate a weak evidence of herding behavior, while other authors do not report any anomaly.

Regarding the U.S. market, the estimated coefficients are significant but not considerably different from zero: therefore it is not possible to affirm with certainty the presence of herding behavior in this market.

The Dratio for other countries excluding China are the following: 1.374 for Brazil, 1.064 for Russia, 1.120 for India, 0,903 for South Africa and 1.093 for the US. Excluding South Africa, all stock markets analyzed show higher Dratio compared to the Chinese market.

4.3 Influence of the U.S. market

4.3.1 RESEARCH HYPOTHESIS

The second research hypothesis concerns the influence of U.S. market movements in the choice of Chinese and international investors. The estimating equations suggested by CCK are not appropriate to identify the influences among markets.

Considering the extreme speed and the decrease in the cost of information dissemination, together with the increased global connectivity due to new technologies, the absence of factors of explanation in addition to those belonging solely to the market analysis is an error. For this reason, we adopt the formulation proposed by (Masih and Masih, 2001) using the following equation:

$$\mathrm{CSAD_t} = \alpha + \gamma_1 \mathrm{R_{m,t}} + \gamma_2 \left|\mathrm{R_{m,t}}\right| + \gamma_3 \mathrm{R^2_{m,t}} + \gamma_4 \mathrm{CSAD_{US,t}} + \gamma_5 \mathrm{R^2_{US,m,t}} + \varepsilon_t \qquad (12)$$

where the $\mathrm{CSAD_{US,t}}$ which is the cross-sectional absolute deviation of the U.S. market and $R^2_{US,m,t}$, that is the US market return squared, both at time t, compare as argument. When we estimate the equation (11) for China, Russia and India, we use the lagged data for U.S. market due to time lag in the USA. Table 3 shows the results of our analysis.

<< INSERT TABLE 3 HERE >>

4.3.2 EMPIRICAL EVIDENCE IN CHINA

Consistent with previous results in literature, the markets analyzed show imitative behavior, but they differ in terms of magnitude. This can be seen by the values of coefficients

of $R^2_{m,t}$ in every single model. For China, for example, it is not possible to find this evidence clearly. Also with regards to the impact of the U.S. market movements, the coefficients of the $CSAD_{US,t}$ and $R^2_{US,m,t}$ are not statistically significant for the Chinese market.

4.3.3 COMPARATIVE ANALYSIS WITH OTHER BRICS COUNTRIES

The inclusion of variables relating to the U.S. market significantly increases the ability to capture variance of the models, as detected by the R-squared statistics. Consistent with Chiang and Zheng (2010), the coefficients of $CSAD_{US,t}$ are positive for all other BRICS countries and statistically significant. This supports the reasonable expectation of a high influence of the U.S. market to other emerging countries.

The coefficients of $R^2_{US,m,t}$ are indeed negative and significant for India and South Africa. As this indicates the influence of extreme movements in the market, we can sustain that in these markets are present herd behavior triggered by extreme movements of the U.S. market. This evidence is clearer among markets belonging to BRICS that show a higher imitative stand-alone behavior.

4.4 Herding up and down

4.4.1 RESEARCH HYPOTHESIS

The third research hypotheses concerns the presence of herd behavior in different market conditions. The scientific literature has shown on many occasions the presence of asymmetric behavior related to specific market conditions (Longin and Solnik, 2001).

In order to analyze the behavior of investors in different market phases, we create a dummy variable D that will diversify our estimates in view of market sentiment. The equation is:

$$CSAD_t = \alpha + \gamma_1 D\, R_{m,t} + \gamma_2 (1 - D)\, R_{m,t} + \gamma_3 D R^2_{m,t} + \gamma_3 (1 - D) R^2_{m,t} + \gamma_4 CSAD_{US,t} + \gamma_5 R^2_{US,m,t} + \varepsilon_t \quad (13)$$

where D=1 if $R_{m,t}$ is negative and zero otherwise. Table 4 shows the results of our estimates.

<< INSERT TABLE 4 HERE >>

4.4.2 EMPIRICAL EVIDENCE IN CHINA

The difficulty of interpreting the results on the Chinese market is also reflected in this analysis. However, the division of the time series taking into account market conditions allows us to identify significant and negative coefficients for the bearish markets. A negative parameter, but with low significance, is present for the variable indicating the influence of the U.S. market. Briefly, it is possible to say that in adverse market conditions there is a phenomenon of imitation in the Chinese market both endogenous and induced from the U.S. market.

4.4.3 COMPARATIVE ANALYSIS WITH OTHER BRICS COUNTRIES

The division between bullish and bearish markets allows to identify moments in which BRICS countries more likely develop herding behaviors. For all the markets considered, the coefficients are statistically significant and negative in the parameters associated with bear markets. The influence of the U.S. does not change this results, confirming the evidences of the previous analysis. The results are also consistent with those of the equation (11) and the related Dratio. Notably, under conditions of negative market can clearly identify herding behavior. This is true also in markets where in previous analysis (Hp1: without dummy) was not possible to state with certainty the presence of such behavior: Russia and Brazil.

4.5 Herding and the financial crisis

4.5.1 RESEARCH HYPOTHESIS

Our fourth research hypotheses concerns the verification of herd behavior before and after the financial crisis. It is difficult to identify a period of time as the turning point of the financial crisis (Claessens et al., 2009); in order to analyze changes in herd behavior before and after this break point we split our sample of analysis pre and post September 2008, to coincide with the bankruptcy of the investment bank Lehman Brothers Holdings Inc. As a result, our sample has 4,046 daily observations prior to August 31, 2008 and 1,173 observations from September 1, 2008 to March 1, 2013

<< INSERT TABLE 5 HERE >>

4.5.2 EMPIRICAL EVIDENCE IN CHINA

In the period before the financial crisis, it is not possible to find strong empirical evidence suggesting the presence of herd behavior in China. Data largely confirm those ones already presented in the test of the hypothesis 2 (Table 3): the coefficient that detects the presence of herd behavior is negative but significant only at 5%.

On another side, however, using data related to the post-crisis period, there is a clear and significant finding of herd behavior in the market; it remains also unchanged the independence of Chinese investors with respect to the U.S. market.

4.5.3 COMPARATIVE ANALYSIS WITH OTHER BRICS COUNTRIES

With comparison to other BRICS countries, the analysis of the sub-sample before the financial crisis does not change significantly the results achieved in the previously. Brazil and Russia confirm herding behavior within their respective markets and do not show significant dependence on the US market. India confirms herding behavior (although the coefficient is not statistically significant, but still negative) and the dependence on the US market. Finally, South Africa does not show strong empirical evidence of herding behavior with regard to internal and US markets. Concerning the second period of the analysis, the financial crisis appears to produce a fracture with respect to the past. In fact, except for India, it is not possible to identify significant empirical evidence of herding behavior either within the markets themselves, or between national markets and the US.

The available data are still fewer and less significant than those ones used in the first period of the analysis. However, these results encourage us to deepen the studies on imitative behavior in the light of changing market conditions that occurred after the financial crisis.

4.6 Herding during market stress conditions

4.6.1 RESEARCH HYPOTHESIS

During periods of market stress, forecasts are more complex due to the presence of the high volatility. For this reason, in correspondence with extreme movements of price, we can expect an increase of the imitative behavior among investors.

Following Christie and Huang (1995) we isolated the level of dispersion in the extreme tails of the distribution; then we tried to identify herding behavior distinguishing periods of

extreme market stress in cases of positive and negative abnormal returns. Hence, we run equation 14:

$$S_t = \alpha + \gamma_1 D_t^U R_{m,t} + \gamma_2 D_t^D R_{m,t} + \varepsilon_t \quad (14)$$

where S_t is the dispersion index, D_t^U is a dummy variable with a value of 1 if $R_{m,t}$ lies in the extreme upper tail of return distribution and zero otherwise, and D_t^D is also a dummy variable with a value of 1 if $R_{m,t}$ lies in the extreme lower tail of return distribution and zero otherwise. To identify the tails of the distribution of returns we adopt two criteria: 1% and 5%. Finally, we conduct our analysis using both indices of dispersion, calculated following CSSD and CSAD equations. Our formulation differs significantly from the one proposed by CH where the regression was conducted using the dummy as independent variable itself. According our previous analysis, in fact, we decided to multiply these variables with the market extreme return, in order to capture the intensity of the phenomenon better. Again, negative values of γ_1 and γ_2 would be consistent with the presence of herding behavior. Table 6 shows the results of our model.

<< INSERT TABLE 6 HERE >>

4.6.2 EMPIRICAL EVIDENCE IN CHINA

There are no previous analysis in this field of research comparable to our results. The approach adopted in our work represents a significant innovation with respect to other studies present in literature.

Regarding to China, previous results are not always clear to read and sometimes contradictory. In this case however it appears clear and evident the presence of herding behaviors in cases of extreme negative returns. The results are the same in all regressions, both with different confidence levels, and using different indices of dispersion. In all models, the significance of the coefficient of extreme negative returns is up to 0.01%.

4.6.3 COMPARATIVE ANALYSIS WITH OTHER BRICS COUNTRIES

The comparison with other BRICS countries shows similar results to those found for China. The coefficients obtained in the estimates corroborate the presence of herding behavior during extreme bear markets. Besides, the use of alternative indices of dispersion does not alter the high significance of the results.

Results for Russia appear very interesting. Herding behavior in bear markets appears significant and very pronounced: the coefficient assumes multiple values of those ones of other countries. Moreover, the R-squared is higher than that one obtained in other estimates and encourages affirming that herding behavior is extraordinary high in this country.

Our analysis confirms the results present in literature that herding behavior are more significant during market downturns and stress conditions, when diversification benefits should help more. This phenomenon leads to a less diversification achieved by investors' portfolios when it should reveal its usefulness.

5. Conclusions

The aim of this paper is the analysis of the presence of herding behavior in the Chinese stock market. The study was conducted comparing continuously the results on the largest Asian economy to the performance of other emerging equity markets as Brazil, Russia, India, South Africa, which together with China constituent the so called BRICS countries. We also included in our analysis the U.S. marker as a point of reference of the largest advanced economy.

The study is conducted through three separate research hypotheses. Firstly, we investigated for the presence of herd behavior in the markets analyzed; then, we explored the influence of the U.S. market movements on BRICS markets; finally we examined the different behavior of the investors in relation to changing market conditions.

Regard to the first research hypothesis, our analysis do not allow us to identify clearly herding behavior in the Chinese market; however, due to the methodology adopted, we cannot affirm the full rationality of Chinese investors. In fact, the models proposed detect the presence of herding behaviors but do not measure the amount of information used by investors in their decision-making processes, nor the quality of the processes themselves. All BRICS countries , China excluded, show indeed significant coefficients consistently with the presence of herding behavior in these markets, even if in Russia such evidence is weaker than the other countries.

As expected, the coefficients for the US are significant but not considerably different from zero; therefore it is impossible recognize herding behavior in that market.

The second research hypothesis concerns the study of the influence of the U.S. market. The results show that markets already characterized by herd behavior are strongly influenced by U.S. market movements. On one hand, we note that China, together with Brazil and Russia, are not affected by this influence, probably because it is more difficulty for foreign institutional investors to enter these domestic equity markets; on the other hand, we see that because their domestic market are opener to foreign investors with respect to previous ones, India and South Africa show a high degree of dependence on the US market.

Then, in the third research hypothesis we introduce the variable that captures the contingent market dynamic. This change to the estimating equations allows to identify the moment when herding behavior occurs. This analysis has allowed us to identify herding behavior even in markets where initially it was not possible to detect this anomaly. Besides, herding behavior appears to be much larger in bearish markets, than in positive trend situation.

Besides, the forth hypothesis testing the impacts of the crisis on herding behavior shows that it is not possible, except for India, to identify significant empirical evidence of herding behavior either within the markets themselves, or between national markets and the US.

Finally, our fifth research hypothesis concerns the study of herding behavior in extreme market conditions. Our findings confirm the presence of herding behavior during periods of negative market stress when correlations increases, even if in these situations the benefits of diversification should be more helpful.

Summarizing, our study shows that herding behavior is more present in those markets where information are more disclosed and investors are more willing and free to enter, such as India and South Africa.

Future developments of our study could include the analysis on different time horizons and the adoption of different collection periods (particularly weekly and monthly). Finally, it could be interesting to extend the analysis to countries outside the BRICS groups but with similar fundamental characteristics, such as Indonesia, which is in fact going to join the BRICS members.

The results highlight the intensification of this behavioral occurrence especially during bear markets: this occurrence reduces the diversification benefits of financial portfolios accessible through investment in international markets. In other words, an asset manager who invests in BRICS countries looking for diversification sees a flattening of returns at a time when

diversification is more need. These results suggest more in-depth studies about the herd behavior and their effect in the movements of stock prices.

The asset allocation process should incorporate these occurrences that traditional risk assessment methodologies do not take into account, considering for example the procedures of assessment of Value-at-Risk models where the left tail of the return distribution could be usefully modified to take into account of the amplification of market stress produced by herding behaviors.

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Table 1: Summary statistics

CHINA

Panel 1

Variable	CSSD	CSAD	Rm	Abs_Rm	Sq_Rm
Min	0.000	0.000	-0.321	0.000	0.000
Max	0.155	0.119	0.269	0.321	0.103
Mean	0.022	0.016	0.000	0.013	0.000
St.Dev	0.011	0.008	0.021	0.016	0.002
Skewness	1.430	1.629	-0.263	4.705	30.026
Kurtosis	10.859	11.735	23.321	52.652	1200.093
Obs.	5208	5208	5208	5208	5208

BRAZIL

Panel 2

Variable	CSSD	CSAD	Rm	Abs_Rm	Sq_Rm
Min	0.000	0.000	-0.122	0.000	0.000
Max	0.728	0.122	0.126	0.126	0.016
Mean	0.041	0.015	0.000	0.009	0.000
St.Dev	0.041	0.008	0.013	0.010	0.001
Skewness	7.934	3.346	-0.584	3.667	12.993
Kurtosis	88.358	25.403	11.730	23.654	232.308
Obs.	4866	4866	4866	4866	4866

RUSSIA

Panel 3

Variable	CSSD	CSAD	Rm	Abs_Rm	Sq_Rm
Min	0.000	0.000	-0.249	0.000	0.000
Max	1.231	0.483	0.458	0.458	0.210
Mean	0.042	0.017	0.001	0.008	0.000
St.Dev	0.059	0.023	0.018	0.016	0.004
Skewness	7.483	8.836	5.266	10.918	40.696
Kurtosis	90.542	129.160	146.655	206.495	2082.807
Obs.	4692	4692	4692	4692	4692

INDIA

Panel 4

Variable	CSSD	CSAD	Rm	Abs_Rm	Sq_Rm
Min	0.000	0.000	-0.076	0.000	0.000
Max	0.296	0.135	0.066	0.076	0.006
Mean	0.052	0.026	0.000	0.008	0.000
St.Dev	0.026	0.010	0.011	0.008	0.000
Skewness	0.916	0.414	-0.252	2.074	7.571
Kurtosis	3.033	4.975	3.340	7.191	96.216
Obs.	5138	5138	5138	5138	5138

SOUTH AFRICA

Panel 5

Variable	CSSD	CSAD	Rm	Abs_Rm	Sq_Rm
Min	0.000	0.000	-0.116	0.000	0.000
Max	0.379	0.068	0.081	0.116	0.013
Mean	0.044	0.018	0.000	0.008	0.000
St.Dev	0.023	0.007	0.012	0.009	0.000
Skewness	2.488	0.303	-0.671	2.780	13.196
Kurtosis	20.832	2.550	6.427	15.332	289.485
Obs.	5174	5174	5174	5174	5174

UNITED STATES

Panel 6

Variable	CSSD	CSAD	Rm	Abs_Rm	Sq_Rm
Min	0.000	0.000	-0.106	0.000	0.000
Max	0.097	0.059	0.112	0.112	0.012
Mean	0.020	0.014	0.000	0.008	0.000
St.Dev	0.009	0.006	0.012	0.009	0.001
Skewness	1.299	1.227	-0.381	3.425	11.805
Kurtosis	4.573	3.878	10.223	20.195	195.212
Obs.	5160	5160	5160	5160	5160

Table 2: Testing hypothesis 1

CHINA

Panel 1: Models with constant term

Panel 1.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	-0.026***	-0.005	-0.005
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.380***	0.377***
		(0.01)	(0.01)
Sq_Rm (γ_3)			0.030
			(0.08)
Constant	0.022***	0.017***	0.017***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.003*	*0.326*	*0.326*
dfres	*5217*	*5216*	*5215*
BIC	*-32590.2*	*-34629.4*	*-34621.0*

Panel 1.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	-0.029***	-0.011**	-0.011**
	(0.01)	(0.00)	(0.00)
Abs_Rm (γ_2)		0.311***	0.320***
		(0.01)	(0.01)
Sq_Rm (γ_3)			-0.091
			(0.06)
Constant	0.016***	0.011***	0.011***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.006*	*0.387*	*0.387*
dfres	*5217*	*5216*	*5215*
BIC	*-35571.9*	*-38089.9*	*-38083.6*

Dratio: 0.934

Panel 2: Models without constant term

Panel 2.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	-0.021	0.026*	0.021*
	(0.02)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.900***	1.154***
		(0.01)	(0.01)
Sq_Rm (γ_3)			-3.468***
			(0.12)
No Constant			
R-sqr	*0.000*	*0.591*	*0.644*
dfres	*5218*	*5217*	*5216*
BIC	*-23948.7*	*-28601.4*	*-29320.2*

Panel 2.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	-0.025*	0.010	0.006
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.662***	0.841***
		(0.01)	(0.01)
Sq_Rm (γ_3)			-2.435***
			(0.09)
No Constant			
R-sqr	*0.001*	*0.622*	*0.673*
dfres	*5218*	*5217*	*5216*
BIC	*-27417.9*	*-32480.7*	*-33227.9*

*Legend: *p<0.05, **p<0.01, ***p<0.001*

BRAZIL

Panel 3: Models with constant term

Panel 3.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	0.302***	0.387***	0.367***
	(0.04)	(0.04)	(0.04)
Abs_Rm (γ_2)		1.221***	1.572***
		(0.06)	(0.10)
Sq_Rm (γ_3)			-6.541***
			(1.58)
Constant	0.041***	0.031***	0.029***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.010*	*0.099*	*0.103*
dfres	*4866*	*4865*	*4864*
BIC	*-17381.1*	*-17835.4*	*-17844.0*

Panel 3.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	0.034***	0.065***	0.060***
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.454***	0.549***
		(0.01)	(0.02)
Sq_Rm (γ_3)			-1.771***
			(0.29)
Constant	0.015***	0.011***	0.010***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.003*	*0.292*	*0.298*
dfres	*4866*	*4865*	*4864*
BIC	*-32676.7*	*-34338.5*	*-34367.1*

Dratio: 1.374

Panel 4: Models without constant term

Panel 4.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	0.399***	0.534***	0.378***
	(0.06)	(0.05)	(0.05)
Abs_Rm (γ_2)		2.744***	4.108***
		(0.05)	(0.08)
Sq_Rm (γ_3)			-34.545***
			(1.49)
No Constant			
R-sqr	*0.008*	*0.398*	*0.457*
dfres	*4867*	*4866*	*4865*
BIC	*-13920.2*	*-16339.1*	*-16838.3*

Panel 4.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	0.068***	0.117***	0.064***
	(0.02)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.988***	1.451***
		(0.01)	(0.02)
Sq_Rm (γ_3)			-11.726***
			(0.34)
No Constant			
R-sqr	*0.003*	*0.595*	*0.675*
dfres	*4867*	*4866*	*4865*
BIC	*-25879.3*	*-30252.3*	*-31323.2*

*Legend: *p<0.05, **p<0.01, ***p<0.001*

RUSSIA

Panel 5: Models with constant term

Panel 5.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	1.180***	-0.393***	0.115**
	(0.03)	(0.03)	(0.04)
Abs_Rm (γ_2)		2.079***	2.861***
		(0.04)	(0.04)
Sq_Rm (γ_3)			-0.924***
			(0.03)
Constant	0.041***	0.025***	0.020***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.273*	*0.578*	*0.635*
dfres	*4782*	*4781*	*4780*
BIC	*-13572.2*	*-16159.3*	*-16849.2*

Panel 5.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	0.792***	-0.104***	0.044***
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		1.184***	1.412***
		(0.01)	(0.01)
Sq_Rm (γ_3)			-0.269***
			(0.01)
Constant	0.016***	0.008***	0.006***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.509*	*0.917*	*0.937*
dfres	*4782*	*4781*	*4780*
BIC	*-22234.4*	*-30737.6*	*-32051.8*

Dratio: 1.064

Panel 6: Models without constant term

Panel 6.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	1.224***	-0.734***	0.049
	(0.03)	(0.04)	(0.04)
Abs_Rm (γ_2)		2.560***	3.453***
		(0.04)	(0.04)
Sq_Rm (γ_3)			-1.232***
			(0.03)
No Constant			
R-sqr	*0.215*	*0.605*	*0.688*
dfres	*4783*	*4782*	*4781*
BIC	*-11701.7*	*-14980.5*	*-16095.2*

Panel 6.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	0.810***	-0.206***	0.024**
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		1.328***	1.590***
		(0.01)	(0.01)
Sq_Rm (γ_3)			-0.361***
			(0.01)
No Constant			
R-sqr	*0.425*	*0.899*	*0.931*
dfres	*4783*	*4782*	*4781*
BIC	*-20400.1*	*-28711.2*	*-30530.6*

*Legend: *p<0.05, **p<0.01, ***p<0.001*

INDIA

Panel 7: Models with constant term

Panel 7.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	0.049	0.092**	0.083*
	(0.03)	(0.03)	(0.03)
Abs_Rm (γ_2)		0.736***	0.976***
		(0.05)	(0.10)
Sq_Rm (γ_3)			-7.760**
			(2.79)
Constant	0.052***	0.046***	0.045***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.000*	*0.046*	*0.047*
dfres	*5136*	*5135*	*5134*
BIC	*-22845.6*	*-23077.0*	*-23076.2*

Panel 7.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	0.019	0.063***	0.055***
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.756***	0.968***
		(0.02)	(0.03)
Sq_Rm (γ_3)			-6.837***
			(0.94)
Constant	0.026***	0.020***	0.019***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.000*	*0.308*	*0.316*
dfres	*5136*	*5135*	*5134*
BIC	*-32384.2*	*-34268.2*	*-34312.8*

Dratio: 1.120

Panel 8: Models without constant term

Panel 8.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	0.004	0.248***	0.060
	(0.08)	(0.05)	(0.05)
Abs_Rm (γ_2)		3.778***	6.608***
		(0.05)	(0.09)
Sq_Rm (γ_3)			-122.945***
			(3.36)
No Constant			
R-sqr	*0.000*	*0.491*	*0.597*
dfres	*5137*	*5136*	*5135*
BIC	*-14667.8*	*-18133.6*	*-19317.0*

Panel 8.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	-0.003	0.130***	0.045*
	(0.04)	(0.02)	(0.02)
Abs_Rm (γ_2)		2.066***	3.340***
		(0.02)	(0.03)
Sq_Rm (γ_3)			-55.367***
			(1.28)
No Constant			
R-sqr	*0.000*	*0.647*	*0.741*
dfres	*5137*	*5136*	*5135*
BIC	*-22280.4*	*-27617.4*	*-29197.3*

*Legend: *p<0.05, **p<0.01, ***p<0.001*

SOUTH AFRICA

Panel 9: Models with constant term

Panel 9.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	-0.053*	0.013	-0.006
	(0.03)	(0.03)	(0.03)
Abs_Rm (γ_2)		0.617***	0.834***
		(0.04)	(0.07)
Sq_Rm (γ_3)			-5.435***
			(1.38)
Constant	0.044***	0.039***	0.038***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.001*	*0.053*	*0.056*
dfres	*5172*	*5171*	*5170*
BIC	*-24396.8*	*-24666.6*	*-24673.5*

Panel 9.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	-0.054***	-0.016*	-0.020*
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.350***	0.391***
		(0.01)	(0.02)
Sq_Rm (γ_3)			-1.038*
			(0.41)
Constant	0.018***	0.015***	0.015***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.008*	*0.174*	*0.175*
dfres	*5172*	*5171*	*5170*
BIC	*-36296.3*	*-37237.6*	*-37235.5*

Dratio: 0.903

Panel 10: Models without constant term

Panel 10.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	-0.016	0.278***	-0.003
	(0.06)	(0.04)	(0.04)
Abs_Rm (γ_2)		2.922***	4.609***
		(0.04)	(0.06)
Sq_Rm (γ_3)			-58.802***
			(1.71)
No Constant			
R-sqr	*0.000*	*0.489*	*0.584*
dfres	*5173*	*5172*	*5171*
BIC	*-16343.6*	*-19808.9*	*-20866.8*

Panel 10.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	-0.039	0.083***	-0.019
	(0.02)	(0.01)	(0.01)
Abs_Rm (γ_2)		1.217***	1.830***
		(0.01)	(0.02)
Sq_Rm (γ_3)			-21.384***
			(0.59)
No Constant			
R-sqr	*0.001*	*0.579*	*0.665*
dfres	*5173*	*5172*	*5171*
BIC	*-26282.4*	*-30750.2*	*-31923.0*

*Legend: *p<0.05, **p<0.01, ***p<0.001*

USA

Panel 11: Models with constant term

Panel 11.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	-0.012	0.010	0.010
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.450***	0.455***
		(0.01)	(0.02)
Sq_Rm (γ_3)			-0.098
			(0.39)
Constant	0.020***	0.016***	0.016***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.000*	*0.217*	*0.217*
dfres	*5217*	*5216*	*5215*
BIC	*-34335.0*	*-35600.5*	*-35592.0*

Panel 11.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	-0.002	0.015*	0.015*
	(0.01)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.333***	0.336***
		(0.01)	(0.01)
Sq_Rm (γ_3)			-0.071
			(0.26)
Constant	0.014***	0.011***	0.011***
	(0.00)	(0.00)	(0.00)
R-sqr	*0.000*	*0.263*	*0.263*
dfres	*5217*	*5216*	*5215*
BIC	*-38485.6*	*-40066.4*	*-40057.9*

Dratio: 1.093

Panel 12: Models without constant term

Panel 12.A: CSSD Model

	m1	m2	m3
Rm (γ_1)	0.046	0.080***	0.031*
	(0.02)	(0.02)	(0.02)
Abs_Rm (γ_2)		1.326***	2.037***
		(0.02)	(0.02)
Sq_Rm (γ_3)			-20.001***
			(0.56)
No Constant			
R-sqr	*0.001*	*0.546*	*0.636*
dfres	*5218*	*5217*	*5216*
BIC	*-25015.5*	*-29128.7*	*-30276.1*

Panel 12.B: CSAD Model

	m1	m2	m3
Rm (γ_1)	0.038*	0.061***	0.029**
	(0.02)	(0.01)	(0.01)
Abs_Rm (γ_2)		0.917***	1.391***
		(0.01)	(0.02)
Sq_Rm (γ_3)			-13.342***
			(0.37)
No Constant			
R-sqr	*0.001*	*0.568*	*0.655*
dfres	*5218*	*5217*	*5216*
BIC	*-29062.4*	*-33424.7*	*-34589.7*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Table 3: Testing hypothesis 2

	China	Brazil	Russia	India	South Africa
Rm	-0.011**	0.063***	0.047***	0.059***	-0.017*
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Abs_Rm	0.320***	0.531***	1.406***	0.990***	0.366***
	(0.01)	(0.02)	(0.01)	(0.03)	(0.02)
Sq_Rm	-0.093	-1.890***	-0.267***	-7.530***	-1.567***
	(0.06)	(0.29)	(0.01)	(0.91)	(0.38)
CSAD_US	0.023	0.076***	0.063**	0.379***	0.415***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Sq_Rm_US	-0.205	0.681**	0.399	-2.734***	-0.585**
	(0.18)	(0.22)	(0.25)	(0.24)	(0.18)
Constant	0.011***	0.009***	0.005***	0.014***	0.009***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-sqr	*0.388*	*0.304*	*0.937*	*0.358*	*0.281*
dfres	*5213*	*4862*	*4778*	*5132*	*5168*
BIC	*-38069.0*	*-34393.5*	*-32053.0*	*-34622.0*	*-37927.0*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Table 4: Testing hypothesis 3

	China	Brazil	Russia	India	South Africa
Rm_D	-0.336***	-0.450***	-1.594***	-1.006***	-0.364***
	(0.01)	(0.02)	(0.02)	(0.04)	(0.02)
Rm_U	0.301***	0.621***	1.464***	0.932***	0.423***
	(0.01)	(0.02)	(0.01)	(0.04)	(0.03)
Sq_Rm_D	-0.158*	-1.460***	-2.646***	-10.762***	-0.823*
	(0.07)	(0.34)	(0.16)	(1.08)	(0.42)
Sq_Rm_U	0.006	-2.636***	-0.273***	-2.279	-4.341***
	(0.09)	(0.43)	(0.01)	(1.32)	(0.71)
CSAD_US	0.023	0.077***	0.040	0.373***	0.419***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Sq_Rm_US	-0.200	0.695**	0.266	-2.690***	-0.615***
	(0.18)	(0.22)	(0.24)	(0.24)	(0.18)
Constant	0.011***	0.009***	0.005***	0.014***	0.009***
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
R-sqr	*0.388*	*0.305*	*0.940*	*0.361*	*0.284*
dfres	*5212*	*4861*	*4777*	*5131*	*5167*
BIC	-38062.7	-34390.5	-32265.6	-34643.7	-37939.8

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Table 5: Testing hypothesis 4

Panel 1: Before 31st August, 2008 (Pre-crisis)

	China	Brazil	Russia	India	South Africa
Rm	0.000	0.084***	0.042***	0.068***	-0.015
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Abs_Rm	0.338***	0.628***	1.407***	1.096***	0.384***
	(0.01)	(0.02)	(0.01)	(0.04)	(0.02)
Sq_Rm	-0.150*	-3.228***	-0.265***	-7.743***	-0.846
	(0.06)	(0.41)	(0.01)	(1.02)	(0.60)
CSAD_US	-0.021	0.033	0.038	0.414***	0.440***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
Sq_Rm_US	-0.980	-0.365	-1.628*	-5.057***	0.130
	(0.51)	(0.59)	(0.73)	(0.65)	(0.51)
Constant	0.012***	0.009***	0.005***	0.015***	0.008***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-sqr	*0.406*	*0.271*	*0.943*	*0.394*	*0.260*
dfres	*3983*	*3648*	*3483*	*3940*	*3956*
BIC	*-28736.1*	*-25386.6*	*-22706.3*	*-26566.6*	*-28666.0*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Panel 2: After 1st September, 2008 (Post-crisis)

	China	Brazil	Russia	India	South Africa
Rm	-0.103***	0.015	-0.005	0.025*	-0.008
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Abs_Rm	0.402***	0.237***	0.977***	0.714***	0.181***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Sq_Rm	-4.454***	0.561	3.210***	-5.378***	-0.310
	(0.49)	(0.32)	(0.89)	(1.18)	(0.44)
CSAD_US	0.202***	0.331***	0.353***	0.086***	0.424***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Sq_Rm_US	-0.318	0.536**	-0.143	0.365*	-0.480**
	(0.17)	(0.19)	(0.17)	(0.18)	(0.18)
Constant	0.009***	0.008***	0.005***	0.014***	0.011***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-sqr	*0.434*	*0.602*	*0.812*	*0.528*	*0.428*
dfres	*964*	*964*	*960*	*956*	*960*
BIC	*-7719.9*	*-7614.6*	*-7741.5*	*-7576.6*	*-7560.7*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Table 6: Testing hypothesis 5

Panel 1.A: CSSD 1%

	China	Brazil	Russia	India	South Africa	US
Rm_BU	0.342***	1.744***	1.600***	1.095***	0.227**	0.421***
	(0.01)	(0.10)	(0.03)	(0.10)	(0.08)	(0.02)
Rm_BD	-0.284***	-0.448***	-2.253***	-0.175*	-0.444***	-0.386***
	(0.01)	(0.09)	(0.09)	(0.09)	(0.06)	(0.02)
Constant	*0.021****	0.040***	0.039***	0.051***	0.044***	0.020***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-sqr	*0.147*	*0.060*	*0.495*	*0.023*	*0.011*	*0.118*
dfres	*5205.000*	*4863.000*	*4690.000*	*5135.000*	*5171.000*	*5157.000*
BIC	*-33363.772*	*-17616.931*	*-14958.526*	*-22955.692*	*-24443.729*	*-34829.016*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Panel 1.B: CSSD 5%

	China	Brazil	Russia	India	South Africa	US
Rm_BU	0.300***	1.527***	1.652***	0.778***	0.429***	0.393***
	(0.01)	(0.08)	(0.02)	(0.07)	(0.05)	(0.02)
Rm_BD	-0.307***	-0.630***	-2.362***	-0.263***	-0.402***	-0.351***
	(0.01)	(0.07)	(0.07)	(0.06)	(0.04)	(0.02)
Constant	*0.021****	0.038***	0.035***	0.051***	0.043***	0.019***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-sqr	*0.225*	*0.084*	*0.565*	*0.029*	*0.026*	*0.171*
dfres	*5205.000*	*4863.000*	*4690.000*	*5135.000*	*5171.000*	*5157.000*
BIC	*-33863.539*	*-17747.346*	*-15656.026*	*-22985.304*	*-24522.140*	*-35145.088*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Panel 2.A: CSAD 1%

	China	Brazil	Russia	India	South Africa	US
Rm_BU	0.268***	0.456***	1.055***	0.732***	0.201***	0.313***
	(0.01)	(0.02)	(0.01)	(0.04)	(0.02)	(0.01)
Rm_BD	-0.235***	-0.313***	-1.184***	-0.393***	-0.333***	-0.283***
	(0.01)	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)
Constant	*0.015****	0.014***	0.015***	0.025***	0.017***	0.014***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-sqr	*0.167*	*0.139*	*0.840*	*0.088*	*0.067*	*0.143*
dfres	*5205.000*	*4863.000*	*4690.000*	*5135.000*	*5171.000*	*5157.000*
BIC	*-36442.214*	*-33371.298*	*-26991.705*	*-32846.365*	*-36606.424*	*-39089.476*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*

Panel 2.B: CSAD 5%

	China	Brazil	Russia	India	South Africa	US
Rm_BU	0.243***	0.431***	1.063***	0.649***	0.226***	0.297***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Rm_BD	-0.260***	-0.322***	-1.206***	-0.433***	-0.286***	-0.257***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
Constant	*0.014****	0.014***	0.013***	0.024***	0.017***	0.013***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R-sqr	*0.275*	*0.219*	*0.899*	*0.171*	*0.106*	*0.209*
dfres	*5205.000*	*4863.000*	*4690.000*	*5135.000*	*5171.000*	*5157.000*
BIC	*-37161.830*	*-33847.342*	*-29150.086*	*-33336.883*	*-36825.315*	*-39504.232*

*Legend: * p<0.05, ** p<0.01, *** p<0.001*