DO INDIAN EQUITY MARKETS HERD?: AN EMPIRICAL INVESTIGATION

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Abstract

Our study examines the Indian equity market for herd behaviour under normal market conditions and asymmetrical market movements. Using the daily dataset for the period January 1, 2008 to December 31, 2015 of the CNX Nifty index and its constituent companies, we find no evidence of herd pattern. The analysis also denies the existence of the behavioural bias for asymmetrical market movements. The paper further validates the rational asset pricing models in the context of Indian equity markets. The study is significant as it helps in identification of collective traps that can hamper the efficient functioning of the market and lead to incorrect asset valuations and bubbles. The present study adds to the body of knowledge as most of the prior studies on the subject have ignored Indian equity markets and focused on developed economies. The research has implications for policymakers and market participants as it provides an indication of the effectiveness of the regulatory reforms and implementation of risk management practices.
Keywords: Herd Behaviour, Equity Market, Market Efficiency, Asset Pricing

Introduction

The emerging market of India presents a fruitful ground to examine the investment patterns in equity markets. Investors in financial markets share certain biases and heuristics while trading and these behavioural patterns are reflected in the investment decisions they make. Shiller (1990) in partial support to the efficient market hypothesis opines that psychological and sociological beliefs of investors exert more influence on the financial markets than the economic sense. In the aftermath of the subprime crisis of 2008, global financial markets have witnessed high volatility on account of the increasing pressure from commodity prices side that leads to sentiment driven investing pattern. This behavioural investing and decision making pattern may lead to numerous events in the stock market that are not just driven by fundamental news, but also by emotions and sentiments. Pastine, Pastine and Humberstone (2017) in their book explain that even if all market participants are rational, due to the lack of common knowledge of rationality, may invest in overvalued stocks, expecting others to follow. This will increase the price of an asset creating a bubble. Human beings have an innate sense to be influenced by the crowd and follow the herd. Avery and Zemsky, (1998) opine that herding results in a switch of the individual behaviour towards that of the crowd. "Herding is an obvious intent by investors to copy the behaviour of other investors" (Bhikchandani and Sharma, 2000). Bhikchandani, Hirshleifer and Welch (1992) opine that investors herd when they imitate others in the market and as a result ignore their private information. Herding can lead to information cascades wherein the investors ignore their private information, form herds and follow the actions of other better informed individuals. Those who lead are called "fashion leaders." Other possible reasons for herd pattern are fear of loss, belief that others know more about an investment or high cost of procuring information. Herding can be classified as spurious and intentional. Devenow and Welch (1996) distinguish between rational and irrational herding. Former focuses on optimal decision making that is distorted due to informational difficulties or incentive issues. Irrational herd behaviour on the other hand focuses on investors behaving like lemmings by foregoing their rationality and blindly following each other. The current study is an attempt to investigate herd behaviour in the Indian equity market. This research work contributes to the literature as only a handful of studies till date have concentrated on examining Indian markets for behavioural biases, despite of having numerous studies on the developed markets. Secondly, Certain characteristics are specific to the Indian equity markets that make its functioning distinct from the international context. For instance the proportion of retail investor participation, evolving nature of the market, transaction costs, investment in financial assets vis-a-vis other asset classes. Thirdly, the micro and macrostructure and the level of stock turnover in Indian markets make for an interesting study. These features have a potential to dictate the behavioural biases and investment patterns for investors. We attempt to examine the herd pattern in Indian equity market on an aggregate basis and also during asymmetrical market movements. The paper is arranged as follows: Section 2 is the review of literature followed by objectives, data and methodology in section 3. The next section is results and interpretation. The last section concludes the paper and is followed by references.

Literature Review

Keynes (1936) stresses upon the importance of herd behaviour and points that people are more likely to herd during times of uncertain environment as they seek assurance and fear making errors individually. Studies on herd pattern across various financial markets have given contrasting results. The research on herding can primarily be studied under two categories. The first category evaluates for the presence of herding among various types of market participants like security analysts, foreign institutional investors, mutual funds and newsletters. These studies concentrate on evaluating herd pattern as a result of the interactions among various market participants. The classical work of Lakonishok, Shleifer and Vishny [LSV] (1992) examines the investment behaviour of 341 money managers and conclude no evidence of herding. Wermers (1999) uses the LSV (1992) method to conclude some herding among mutual funds. Herding may also be based on external information or in anticipation of some informational payoffs that induces investors to follow the mass without analysis (Devenow and Welch ,1996). Banerjee (1992) shows that investors base their decisions on the decisions of other agents. Kultti and Miettinen(2006) use cost as a basis to study the presence of herding. The study concludes that if incentives exceed costs, then herd pattern gets started after the third agent and if incentives are not sufficient to cover the observation costs, then all investors follow their independent decisions. Scharfstein and Stein (1990) point that agents herd due to reputational reasons and it might be rational for risk averse investors to follow the crowd if their rewards are dependent on relative performance. These agents tend to seek "safety in numbers" during periods of uncertainty (Palley, 1995). Numerous studies cite that uncertain market conditions might lead to herd behaviour (Avery and Zemsky, 1998). Another study to further provide psychological evidence for investors to herd during uncertain times is by Prechter and Parker (2007) and Baddeley (2010). The research reveals that investors are reasonable and conscious in times of certainty whereas they herd during uncertain environment. Domestic investors trading on the Tokyo Stock Exchange herd while foreign investors are observed to be informed with no significant evidence of herding (Iihara, Kato and Tokunaga, 2001). Another strand of literature examines herd pattern by evaluating the return dispersions of the market. The work of Christie and Huang (1995) measures cross sectional standard deviation (CSSD) to examine herd behaviour. The study uses dispersion between market return and individual stock return as a metric to examine herd pattern. According to the model, herd behaviour exists if investors collectively perform the same action and do not deviate much from the market return resulting in decrease in dispersion measure. Chang, Cheng and Khorana (2000) modify this model and use cross sectional absolute deviation (CSAD) to examine herding. Chang et al. (2000) conclude the absence of herding in developed markets of the US and Hong Kong but find the evidence in South Korea and Taiwan. Demirer, Kutan and Chen (2010) also infer herding in Taiwan's stock market using Chang et al. (2000) and Hwang and Salmon (2004) approaches on the daily data. Chiang and Zheng (2010) use the methodology of Christie and Huang (1995) and Chang et al. (2000) and conclude that herding is present in advanced stock markets and Asian markets. On the contrary, it is not significant in the US and Latin American markets. Lao and Singh (2011), using the Chinese and Indian data for the period July 1999 to June 2009 infer that Chinese markets display more herding than Indian markets and is visible during large movements. The test for the presence of herding in China during the crisis period (1st Jan -2008 to 31st Dec-2008) confirms for the existence of the bias. However, this is not true for India. Similar results are reported by Zhang and Zhao (2004) for the Chinese markets. The study finds the presence of herding in both A and B shares' stock market. Tan, Chiang, Mason and Nelling (2008) also find that Chinese markets display herd phenomenon during both rising and declining phases. Kumar and Bharti (2017) conclude no significant herding in information technology sector in India. In another study Kumar, Bharti and Bansal (2016) report no evidence of herd phenomenon in the Indian equity market at the aggregate market level. Khoshsirat and Salari (2011) examine the Tehran stock exchange using Christie and Huang (1995) and Chang et al. (2000) method at the aggregate market level and within nine industries and conclude no empirical evidence for the complete market, however, automobile and mineral industries display significant pattern. Economou, Kostakis and Philippas (2011) and Caporale, Economou and Philippas (2008) examine four European economies and find herd behaviour in Greece and Italian markets using daily stock returns for the period January 1998 to December 2008 using the methodology of Chang et al. (2000). However, Spain shows no evidence and mixed results are reported for Portugal. Further, the financial crisis does not induce intense herd behaviour in any of the four markets studied. The results are in contrast to the study by Holmes, Kallinterakis and Ferreira (2013) that infers herd behaviour during declining phase for the Portuguese market. In addition, herd coefficient is significant during the post regulation period. In another study by Agudo, Sarto and Vicente (2008), Spanish markets are found to show herd behaviour. Vo and Phan (2016) examine the Vietnam stock market and conclude the evidence of herding during rising and falling market movements albeit with different intensity. The level of herd behaviour is stronger in declining phase before the crisis period. Malik and Elahi (2014) show the existence of herd behaviour in Karachi Stock Exchange for bull and bear markets using ordinary least squares (OLS) estimator and quantile regression (QREG) method. Whereas OLS shows the presence of herding for the entire sample period, QREG shows that herding is more pronounced for lower quantiles. Bekiros, Jlassi, Lucey Naoui and Uddin (2017) use CSAD and QREG method to capture herd behaviour in the US stock markets. The findings indicate that herding intensity is more pronounced under extreme market conditions as depicted in the upper high quantile range in the return distributions. Pochea , Filip &Pece (2017) investigate ten Central and East European countries for herd behaviour using CSAD and QREG estimate. The study finds herding in all countries except Poland and Romania.

Objectives, Data and Methodology

The extant literature on herd behaviour in financial markets lays more emphasis on the developed economies with only a handful of studies on the Indian financial markets. The present study is an attempt to bridge the gap to evaluate herd pattern in the Indian equity market. The current research aims to answer if herd phenomenon exists in the Indian equity markets and is it different during bullish and bearish phases. In addition, the paper will benefit policymakers and investors operating in the Indian market. Analysis of the behaviour of investors is important for the investment cycle in an economy. Any bias in the financial markets leading to collective behaviour can potentially distort asset prices and lead to bubbles or crashes. The results of this study will help in analysing if there is existence of any behavioural traps and biases in the equity market in India.

a) **Objectives**

Following are the research objectives of the study:

1. To identify for the presence of herd behaviour in Indian equity markets at an aggregate level.
2. To examine the herd behaviour under asymmetrical market movements and under extreme market conditions.
3. To examine the herd behaviour in different quantiles of returns on S&P CNX Nifty index.

b) **Data**

We extract the data from the database of Prowess, Centre for Monitoring Indian Economy. Daily data of CNX Nifty Index for the time period January 1, 2008 to December 31, 2015 has been taken. CNX Nifty index is a proxy for the market portfolio. Nifty index has been chosen as it is a leading index globally and the representative of the stock market in India. Also represents almost 62.9 percent of the free float market capitalization of the stocks listed on

National Stock Exchange in addition to recording the highest turnover. The data for the constituent companies, totalling thirty six, is taken and adjusted for any bonus issues or stock splits during the period of study. As a result we have a total of 1980 observations. The sample time period is of special relevance as it includes the trough and crest of the index movement and the financial crisis period of 2008.

c) **Methodology**

The present study uses return dispersion as a measure to examine herd behaviour. Dispersion is defined as a measure to quantify the proximity of individual security returns to the market returns. The model gets its motivation from the linear relationship between dispersion and market return according to the rational asset pricing theories where each investor follows private information and therefore each security's sensitivity to the market return is different that leads to increase in the dispersion measure. However, in case of herd behaviour, investors collectively imitate others in the market by suppressing their own beliefs. As a result, the individual security returns will not deviate much from the market return leading to decrease in the dispersion measure or increase at a decreasing rate. Thus, the linear relationship does not hold true anymore. We use the methodology proposed by Chang et al. (2000) of cross sectional absolute deviation (CSAD). CSAD measures the proximity of the individual stock return to the market return and is given as:

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

Here, R_{it} is the return on security i at time t and R_{mt} is the cross sectional average of N returns in a market portfolio at time t. N is the number of firms in the portfolio. The observed stock return for individual company share, R_{it} is calculated as:

$$R_{it} = \ln\left(\frac{P_t}{P_{t-1}}\right) * 100 \quad (2)$$

where P_t is the price of the stock at time t and P_{t-1} is the price at time t-1. Similarly, market return at time t, R_{mt} is calculated as:

$$R_{mt} = \ln\left(\frac{CVt}{CVt_{-1}}\right) * 100 \quad (3)$$

where CV_t is the closing value of the S&P CNX 50 index at time t.
The regression equation by Chang et al.(2000) is given by:

$$CSAD_t = \beta_0 + \beta_1 \left|R_{mt}\right| + \beta_2 \left(R_{mt}^2\right) + \in_t \quad (4)$$

Where, β_0 is the intercept, β_1 and β_2 are the regression coefficients. The addition of the term $R^2_{m,t}$ makes the relationship non linear. In case herd behaviour exists, the coefficient β_2 is significant and negative. The present paper uses quantile regression estimate instead of ordinary least squares to detect herding in the equity market. QREG is a semi parametric substitute for OLS (mean-based study) and a better estimator. Also as the time series return data is not normal, it is a better substitute. In addition QREG provides regression analysis over the entire return distribution, thus providing a complete picture. In addition, it is better to study the behaviour of investors under stress periods using a model that best gauges the extreme quantiles of the return distribution. Whereas OLS is prone to omit the information in the tail of the return distribution, QREG provides results across the whole family of quantiles. Following is the quantile regression equation:

$$CSAD_t(\tau/x) = \alpha + \eta_1|R_{m,t}(\tau)| + \eta_2[R_{m,t}(\tau)]^2 + \epsilon t \quad (5)$$

Where, CSAD is calculated using (1), τ is the quantile for analysis and η_1 and η_2 are regression coefficients. In equation (5), if the coefficient η_1 and η_2 are positive and statistically significant, then the dispersion increases linearly with the market return. As a result, investor puts more emphasis on fundamentals and not on behavioural biases. Thus, there is no herding. Conversely, a negative and statistically significant η_2 shows an inverse relationship between dispersion and market return. This implies that the linear relationship between CSAD and market return disappears and investors herd. We perform regression using equation (5) for the aggregate market. Next we examine the herd behaviour during up and down market phases at τ=0.10,0.25,0.75 and 0.90. Following is the equation:

$$CSAD_t\left(\frac{\tau}{x}\right) = \alpha + \eta_1\,(1-D)\left|R_{m,t}(\tau)\right| + \eta_2 * D\left|R_{m,t}(\tau)\right| + \eta_3(1-D)[R_{m,t}\,(\tau)]^2 + \eta_4 * D[R_{m,t}(\tau)]^2 + \epsilon t \qquad (6)$$

Here, D is the dummy variable that takes the values D=1, for $R_{m,t}<0$ and D=0 for $R_{m,t} \geq 0$. If η_3 is negative and significant, then we conclude the presence of herd behaviour in rising market. If η_4 is negative and significant, then herding is present in falling markets. Next in order to examine the herd behaviour during extreme market movement, we perform the regression for extreme quantiles of the return distribution. Here we study the extreme low tails of the distribution when the market return lies below 5 percent levels of the distribution. Then we examine the extreme upper tails of the distribution corresponding to the level of 95 percent. We use the following regression equation:

$$CSAD_t\left(\frac{\tau}{x}\right) = \alpha + \eta_1\,(D) * \left|R_{m,t}(\tau)\right| + \eta_2(D) * [R_{m,t}\,(\tau)]^2 + \epsilon t \qquad (7)$$

Here D is the dummy variable and takes the value of 1 if the extreme market return is more than the upper limit at 95 percent of the return distribution or less than 5 percent of the return distribution, else takes the value 0.

Descriptive Results

Table 1 lists the descriptive statistics of the variables under study.

Table 1: Descriptive statistics of CSAD and Market Return

Descriptive	**$CSAD_t$ (whole period)**	**R_{mt} (whole period)**	**$CSAD_t$ (rising market)**	**R_{mt} (rising market)**	**$CSAD_t$ (down market)**	**R_{mt} (down market)**
Mean	0.0177	0.0001	0.0154	0.0102	0.0202	-0.0107
Std. Dev.	0.0102	0.0154	0.0088	0.0111	0.0109	0.0116
Skewness	3.4728	0.0969	4.7188	4.0825	2.9167	-3.0384
Kurtosis	23.769	14.325	44.532	40.734	15.893	20.0036
Jarque-Bera	39568.66	10584.92	77474.55	63660.18	7969.508	12974.16
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
No. of observations	1980	1980	1025	1025	955	955
ADF (CSADt)	-23.220 (0.0000*)					
ADF (Rmt)	-21.108(0.0000*)					

Source: Author's calculations. *significant at 5 percent level

The above table shows the descriptive statistics for the aggregate market. The average of CSAD for the complete time period of study is 0.0177 with standard deviation of 0.010. The mean return of CNX Nifty 50 for the period of study is 0.00013. As is seen, kurtosis value is more than 3 for CSAD and market return implying that our data is not normal. The test statistic of Jarque Bera is significant that further leads to the rejection of null hypothesis of normality. Thus, quantile regression estimate is used. Presence of outliers in the time series data can result in higher values of skewness and kurtosis. As pointed by Koenker and Bassett (1978), quantile regression is a strong tool in finding the outliers. The significant values of ADF for CSAD and R_{mt} implies that both the series are stationary at levels.

Results and interpretation

Table 2: Quantile Regression Results for Overall Market

$CSAD_t(\tau/x) = \alpha + \eta_1\lvert R_{m,t}(\tau)\rvert + \eta_2[R_{m,t}(\tau)]^2 + \epsilon t$				
T	**A**	**η1**	**η2**	**Pseudo R^2**
0.10	0.0075 (24.8721)	0.3014 (8.6628)	2.8266 (14.3634)	0.1716
0.25	0.0094(51.0418)	0.3810 (13.4689)	3.0936 (12.9666)	0.2302
0.50	0.0108 (29.5976)	0.5666 (6.4772)	1.7020 (0.6734)	0.3398
0.75	0.0131(56.3088)	0.6129 (16.8716)	2.8091 (3.9979)	0.4268
0.90	0.01656 (29.5382)	0.5374 (6.5338)	5.0025 (2.4557)	0.4559

Source: Author's calculations t-statistics are shown in parenthesis.

Table 2 above shows quantile regression results for the aggregate market at various levels of τ. We examine the independent variables at each value of τ for its effect on CSAD. From the results above η_2 is not negative for any quantile, even at the median level of τ=0.50. Thus, we conclude that herding is not present in the overall market for the period under study.

Table 3: Quantile Regression under Asymmetric Market Movement

Panel A	$CSAD_t\left(\frac{\tau}{x}\right) = \alpha + \eta_1(1-D)\lvert R_{m,t}(\tau)\rvert + \eta_2 * D\lvert R_{m,t}(\tau)\rvert + \eta_3(1-D)[R_{m,t}(\tau)]^2 + \eta_4 * D[R_{m,t}(\tau)]^2 + \epsilon$					
(τ)	**Pseudo R2**	**α**	**η1**	**η2**	**η3**	**η4**
0.1	0.3709	0.0078	0.738	0.1909	0.1439	2.1247
		(-2.946)	(-.0831)	(-0.942)	(-0.041)	(-7.611)
0.25	0.4014	0.0092	0.7445	0.1776	0.3137	2.4052
		(-0.5810)	(-8.201)	(-.5739)	(-1.520)	(-9.102)
0.5	0.4527	0.0109	0.7419	0.1829	0.8795	5.5354
		(-2.9658)	(-.2623)	(-.2084)	(-0.3079)	(-1.494)
0.75	0.4858	0.0132	0.7348	0.2435	1.4621	5.0551
		(-6.4745)	(-0.692)	(-0.935)	(-3.443)	(-1.851)
0.9	0.4809	0.0167	0.6607	0.2459	3.591	3.228
		(-2.0487)	(-0.477)	(-2.850)	(-1.671)	(-0.992)

Panel B	$CSAD_t\left(\frac{\tau}{x}\right) = \alpha + \eta_1(D) * \lvert R_{m,t}(\tau)\rvert + \eta_2(D) * [R_{m,t}(\tau)]^2 + \epsilon t$							
	Extreme Up Market				**Extreme Down Market**			
T	**Pseudo R2**	**α**	**η1**	**η2**	**Pseudo R2**	**α**	**η1**	**η2**

0.1	0.0506	0.0098	0.3574	2.3971	0.055	0.0098	0.6042	1.3564
		(-84.61)	(-9.966)	(-10.83)		(-84.35)	(-8.643)	(-2.545)
0.25	0.0613	0.0118	0.3906	2.121	0.065	0.0118	0.6573	0.834
		(-99.9312)	(-15.147)	(-13.094)		(-99.153)	(-17.63)	(-2.755)
0.5	0.0732	0.0149	0.3641	2.1679	0.081	0.0149	0.6958	0.3526
		(-91.7246)	(-12.439)	(-11.29)		(-90.81)	(-13.09)	(-0.836)
0.75	0.0864	0.0196	0.3437	2.312	0.109	0.0199	0.7404	0.5915
		(-70.987)	(-0.9514)	(-0.3124)		(-69.807)	(-8.164)	(-0.455)
0.9	0.0873	0.0265	0.2386	3.2242	0.147	0.0273	0.3975	4.7639
		(-46.0354)	(-0.3516)	(-0.2552)		(-45.821)	(-1.703)	(-1.107)

Source: Author's Calculations. t-statistics in parenthesis

Table 3 above gives the results for quantile regression under asymmetrical market movements. Panel A gives the quantile regression results for bull and bear phase of the market. Here, η_3 and η_4 are not negative for any level of quantile for both up and down markets. These results are in contrast with those reported by Vo and Phan (2016) for Vietnam market. Chiang, Li and Tan (2010) also conclude presence of herding in lower and median quantiles for B-share investors. The results are in congruence with Kumar, Bharti and Bansal (2016) who conclude the absence of herding during asymmetrical market movements for Indian stock market using ordinary least squares estimate. Indian equity markets are witnessing improved regulatory environment with better access to timely information and more transparency in the trading mechanism that leads to investors acting rational while making investment choices especially for blue chip stocks of Nifty index. Panel B in the table gives the results for extreme market movements when the returns lie either in the extreme left of the distribution or extreme right. It shows that herding is not present even during extreme market movements, either up or down swings, as the value of η_2 is not significant and negative for any quantile.

Conclusion

The present study examines herd behaviour in the Indian stock market using CNX Nifty 50 (benchmark index of National Stock Exchange) as a proxy for market index for the period January 1, 2008 to December 31, 2015. The choice of examining India is of relevance. According to the report by Morgan Stanley, Indian equity market capitalization is expected to hit USD 6.1 trillion by the year 2027. The Financial Development Report (FDR) published by the World Economic Forum, ranks India 58 out of 140 on Global Competitive Index. Considering the growth potential of the Indian equity markets and the volume of investments, it is imperative to study for the presence of any behavioural bias in the market. Consequently, examining the herd behaviour will assist in developing new insights on market efficiency and guide in developing strategies for investments. Our study uses the methodology of Chang et al. (2000) to evaluate the cross sectional absolute deviation of returns to infer the existence of herd behaviour. The study concludes that Indian equity markets do not herd for the time period of the analysis. We further examine for the presence of herding during market asymmetry, i.e. up and down movements and extreme conditions. We validate the same results even for asymmetrical conditions. Our results are consistent with Lao and Singh (2011) and Garg and Gulati (2013) for the Indian market. According to these studies, herd phenomenon is short lived and not apparent in India. A possible explanation for this can be due to the very low participation of retail investors in the Indian equity market at a meagre

2.4 percent (Chandrasekhar, Malik and Akirti, 2016). The major players in the equity markets being institutional in constitution have more access to the information, reports by analysts and fund managers that reduces the scope of herding as the investment decisions are a result of rational decision making rather than crowd following. The study is significant as it helps in identification of collective traps that can hamper the efficient functioning of the market and lead to incorrect asset valuations and bubbles. The research has implications for policymakers and market participants as it provides an indication of the effectiveness of the regulatory reforms and implementation of risk management practices.

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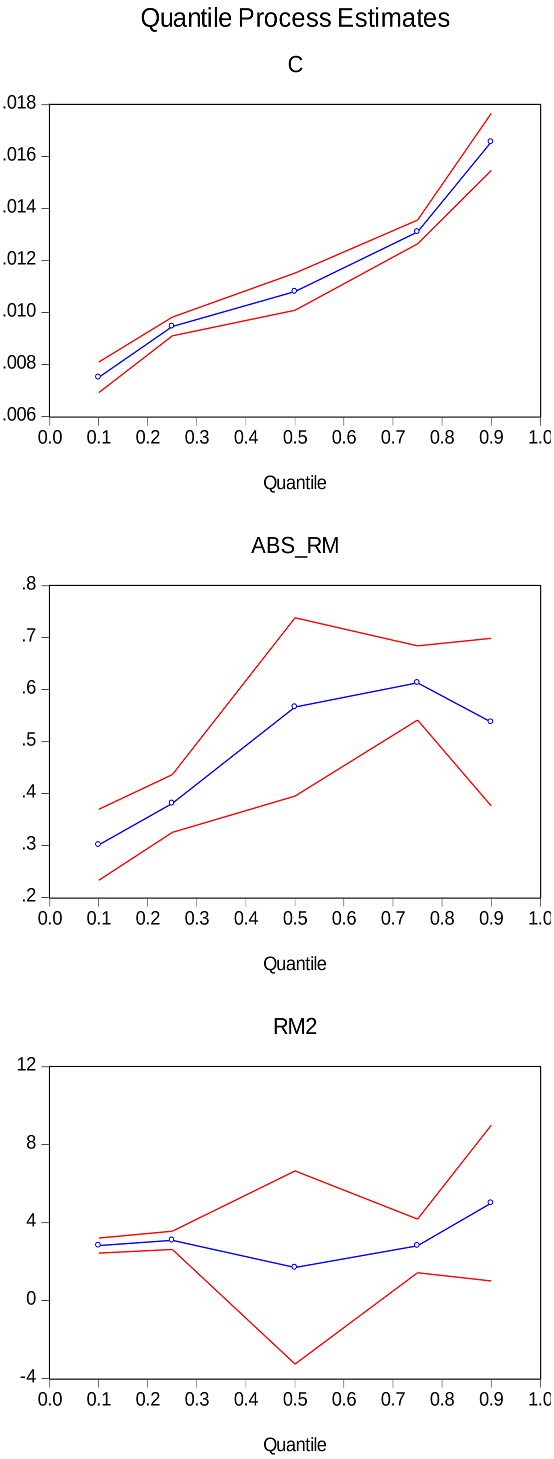
APPENDICES

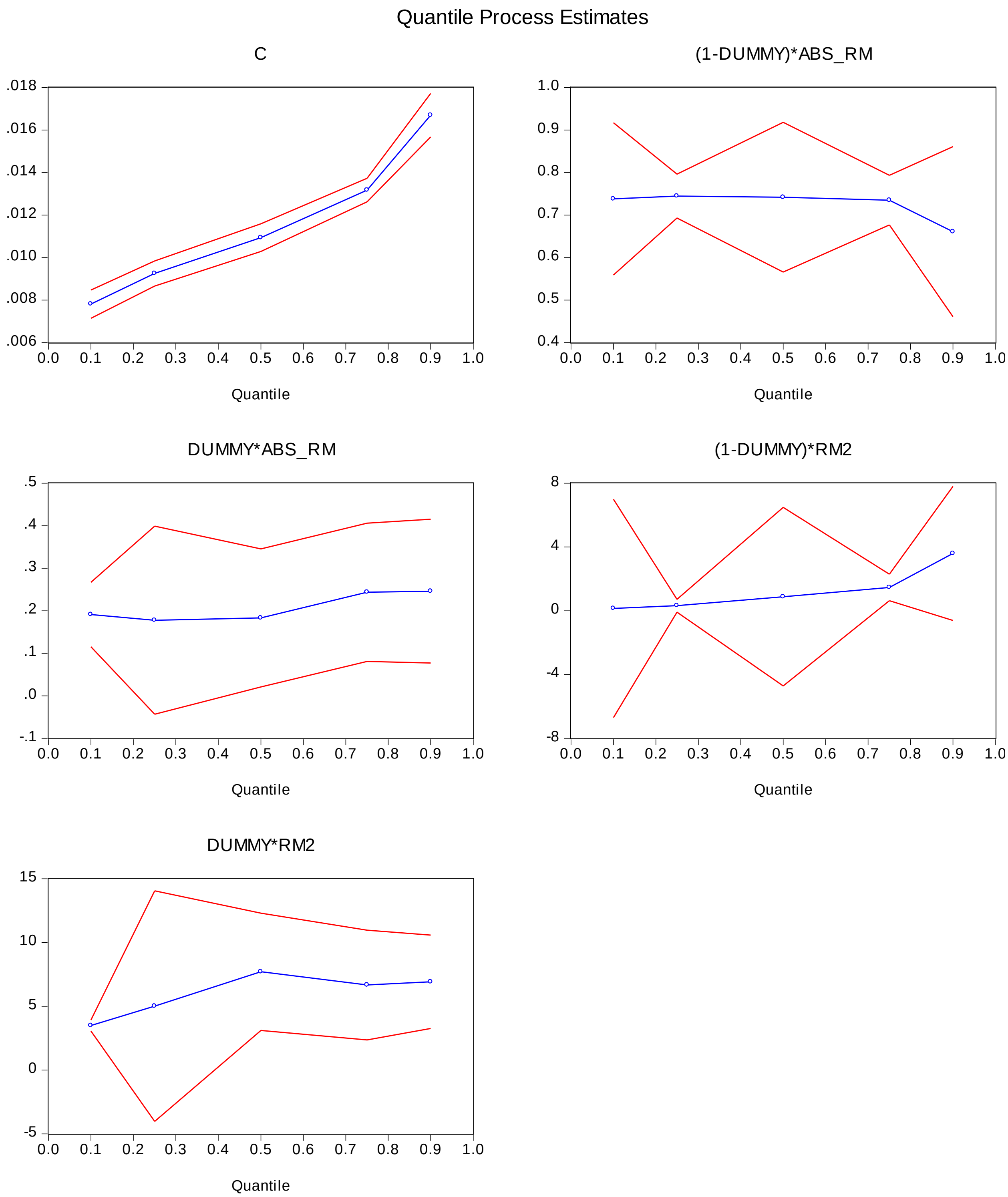
Appendix A: Quantile regression estimate graph for overall market

$$CSAD_t(\tau/x) = \alpha + \eta_1|r_{m,t}(\tau)| + \eta_2[r_{m,t}\,(\tau)]^2 \;+ \epsilon t$$



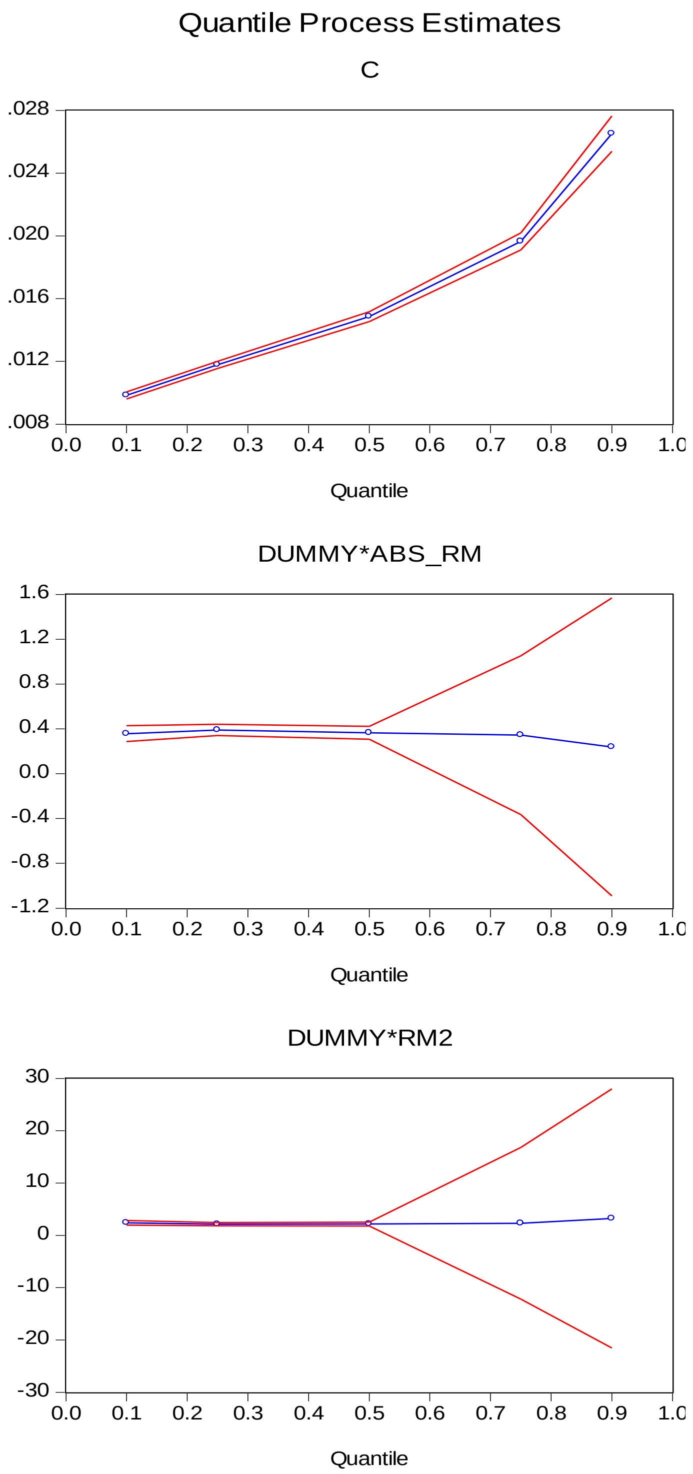
Appendix B: Quantile regression estimate for asymmetrical market conditions

$$CSAD_t\left(\frac{\tau}{x}\right) = \alpha + \eta_1\,(1-D)\left|r_{m,t}(\tau)\right| + \eta_2 * D\left|r_{m,t}(\tau)\right| + \eta_3(1-D)[r_{m,t}\,(\tau)]^2 + \eta_4 * D[r_{m,t}(\tau)]^2 + \epsilon t$$



Appendix C: Quantile regression estimate for extreme up market conditions

$$CSAD_t\left(\frac{\tau}{x}\right) = \alpha + \eta_1\,(D) * \left|r_{m,t}(\tau)\right| + \eta_2(D) * [r_{m,t}\,(\tau)]^2 + \epsilon t$$



<u>Quantile regression estimate for extreme down market conditions</u>

Quantile Process Estimates