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An Examination of Herd Behavior in the Damascus Security Exchange

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ABSTRACT

The paper aims at examining the herd behavior in the Damascus Security Exchange Covering the period 2010-2017 by using Ordinary Least Square and quantile Regression analysis. The results of using Ordinary Least Square, show evidence nonlinear herding. Moreover, in bullish and bearish markets we find evidence of herding in both rising and falling market. Further analysis by applying quantile regression method, the herd behavior is more dominant in the upper tail of the dispersion of return. When quantile regression is used in bullish and bearish markets, herding exists under upper quantile.

Keywords: Herd Behavior, Quantile Regression, Asymmetry.

1. INTRODUCTION

Herding in financial markets has been usually described as a behavioral predisposition for an investor to check out the actions of others. Specialists are thinking about whether herding exists, because the dependence on collective information alternatively than personal information may cause prices to deviate from fundamental value and present profitable trading opportunities. Herding has additionally attracted the attention of academic analysts because the associated behavioral effects on stock price movements may affect their risk and return characteristics and so have implications for asset pricing models.

The existing literature covers a wide array of studies from various perspectives, mainly in economy and psychology (e.g. Christie & Huang, 1995; Prechter, 2011). Furthermore, herd behavior is an important consideration not only for market participants, but also for economists and academics, enabling them to evaluate market movements and also to evaluate risk and return relationship and applicability of asset pricing

models (Shiller, 2006). As herd behavior itself is a generally observable phenomenon, studies are applied on both micro and macro levels (e.g. Christie & Huang, 1995; Goodfellow et. al., 2009).

Herding behavior refers to investors tend to ignore their valuable personal information but choose to follow the most common decision mode. In stock market, it manifests as a mass of investors adopt same investment strategy or have same preference for specific assets.

Moreover, the uncertainty of information also results in herding behavior. Because there has continuous information flows into wide-open financial market, the speed of change is very fast. Furthermore, high cost of information also leads to herding behavior. In ideal market, information has no cost and people can obtain every information they want. However, information has high cost in real market. Sometimes the cost is too high in order that investors have to follow others blindly or get information through others' transaction behavior.

The main objective of this paper is to examine the existence of herding in Damascus Security Exchange. Particularly, we analyze the relationship between the level of equity return dispersions and the market return.

This paper is first of its kind in Damascus Security Exchange and attempts to find existence of herd behavior in the Damascus Security Exchange. It also attempts to find the difference in herding behavior under Bullish and Bearish markets. Whether herding behavior during unusual market conditions differs from the herding behavior under normal market conditions. Further more, to that this research also uses Quantile regression analysis for both normal market conditions and under down and up market. Quantile Regression (QR) permits the evaluation of effects in several items of market return distribution and can be used to have estimates for herding in the tails of market return distribution. Theory shows that herding will be more at the low tail of market return or at extreme market conditions. This paper also discuses difference in results by using ordinary least squared method and Quantile regression analysis.

The remainder of this paper is organized as follows. The next section presents a review of literature. The third section describes data and research methodology. The fourth section presents the results and discussion of results. The final section concludes the paper.

2. LITERATURE REVIEW

This section provides the results of the previous empirical studies, followed by Measures of herding.

A. Empirical Studies

First, research has proven that the characteristics of an emerging market make herd behavior more likely, in comparison with a developed market, to be encountered in such a market (Economou, et. al., 2011). According to Bikhchandani and Sharma (2001), the relative lack of transparency in these markets, weak reporting requirements, lower accounting standards, lax enforcement of regulations, and costly information acquisition inevitably lead to herd behavior. In addition, Chang et. al., (2000) find similar results, collecting significant evidence of herding in South Korea and Taiwan, the two emerging markets in their sample, compared to the US, Hong Kong, and Japan, the developed markets in their sample. A more recent research, based on data from 1999-2009, also provides an empirical evidence of herd behavior on the

emerging markets in Asia (two BRIC countries), more precisely the Chinese and Indian markets, validating the previous mentioned statement (Lao & Singh, 2010).

Second, there are been significant results suggesting that herd behavior patterns are affected by the direction of the market movement, thus, referring to either bull or bear markets. However, these results are restricted to specific stock market characteristics. Lao and Sing (2010) identified that herding behavior in the Chinese market is greater when the market is falling, in contrast to the results on the Indian market, where herding behavior was more profound during rising periods of the market. Therefore, they supported the conclusion by Chiang et. al., (2007), who stated that the level of herding behavior is asymmetric during different market returns in Asian markets.

Lao and Singh (2010) investigated this relationship between the Indian and Chinese market, by comparing herd behavior test results during normal market returns with those under extreme upward or downward market movements, relating to three cutoff criteria. They concluded the presence of more severe herding behavior during market stress, explained from the irrational behavior by inexperienced individual investors who are easily misled by media and blinded by greed and envy.

Additionally, In a study on Empirical Investigation of Herding Behavior in East Asian Stock Markets Toward the U.S. Market by (Yang et. al., 2015), It examined the shift of dominance of the American stock market. It also observe herding behavior changes of major Asia Pacific regions towards the American market in the wake of major events that affected financial markets. Events examined include the Asian financial crisis, Internet bubble, September 11 attacks, SARS outbreak, and global financial crisis. Evidence shows the American stock market still held the leading position over the East Asian markets in the wake of these major events. They defined the continuing bull (and continuing bear) of the American stock market as the dummy variable of herding behavior. They compared the difference in stock returns before and after structural breaks by investigation into the stock markets in Hong Kong, Taiwan, and Japan. They proposed suitable investment strategies related to herding behavior in the East Asian stock markets toward the American stock market. The examination of out-of-sample profitability revealed the proposed investment strategies contributed to significantly positive average portfolio returns, whether in continuing bull or continuing bear markets. (Shih et. al., 2012) examined the herding behavior of investors in the Pacific basin stock markets. They created a new dummy variable about the rise (drop) of the U.S. stock return in succession for 3days, 4days and 5days. Furthermore, they analysis the Pacific basin stock markets herding activity within the U.S. stock market and tried to discover the possible investment strategy.

B. Measures of Herding

Previous empirical researches have also implications for the design of this research, in a sense that several methods of measuring herding in stock markets have been proposed. Thereafter, a growing body of literature analyzed herding in stock markets using measures of dispersion around the market return during periods of significant changes in stock prices (Christie and Huang, 1995; Chang et. al., 2000; Tan et. al., 2008, etc.). Christie and Huang (1995) provided the reason for this by arguing that during periods of market pressure movements, stock returns have the tendency to be more clustered, thereby, indicating a co-movement of stock prices, which is independent of their fundamental characteristics. These periods of market stress are then characterized by the formation of herds since individual investors have a higher tendency to suppress their own beliefs and follow the market consensus.

Consequently, cross-sectional dispersion of returns is predicted to be low in the presence of herding behavior by investors.

More recently, Saastamoinen (2008) they used quantile regression in our estimation. in the Helsinki Stock Exchange. They found that dispersion increases in a less-than-proportional rate with the market return in the lower tail of stock return distribution. This might be the evidence of herding, but this is not the conclusive proof of herding. They also found that the rate of increase is nonlinearly increasing in the upper tail of stock return distribution. This implies that stock return dispersion increases more than CAPM suggests in the rising markets. (Chiang et. al., 2010) This study examined the herding behavior of investors in Chinese stock markets. Using a least squares method, they found evidence of herding within both the Shanghai and Shenzhen A-share markets and no evidence of herding within both B-share markets. A-share investors display herding formation in both up and down markets. However, they cannot found herding activity for B-share investors in the up market. By applying quantile regression analysis to estimate the herding equation, they found supporting evidence of herding behavior in both A-share and B-share investors conditional on the dispersions of returns in the lower quantile region. Al-Shboul (2013) This study examining the herd behavior in the Jordanian equity market before and after the 2008 global financial crisis. By making use of the CH approach, estimated using the Ordinary Least Squares method (OLS), evidence of the absence of herding tendency is reported in extreme and normal market conditions. The model of CCK is estimated using the OLS and the Quantile Regression (QR) methods. The results of CCK, using OLS, show evidence of the absence of linear herding for both types of firms before and after the crisis. But, only nonfinancial firms exhibit evidence of nonlinear herding in both sub-periods. In the extreme up and down market, evidence of linear herding is only found after the crisis for both types of firms when market is trending up. For all firms at the median level, the results of QR provide evidence of linear herding after the crisis while no evidence is reported for nonlinear herding. Financial firms exhibit only nonlinear herding at median level before the crisis when the market is trending up. Nonfinancial firms do not exhibit linear and nonlinear herding at the median level in both up and down markets. The results of OLS and QR are different for both types of firms.

3. DATA AND METHODOLOGY

A. Data

We collected the data of daily closing prices of all stocks listed on the Damascus Security Exchange (DSE) Except company Agricultural Engineering Co for Investments - Nama'a because it is suspended from trading and the DWX-Index (as a proxy for market returns) over the period from 2010 to 2017. The final data set includes 23 firms yielding 1464 daily observations.

B. Methodology

We run the following equation, which is proposed by Chang et. al., (2000) in order to investigate the presence of herding in Damascus Security Exchange:

$$CSAD_t = \gamma_0 + \gamma_1 |R_{m,t}| + \gamma_2 R^2_{m,t} + \varepsilon_t \quad (1)$$

where, $CSAD_t$ is a cross – sectional absolute deviation. It is constructed to measure return dispersions, which is calculated as follows:

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

where, $R_{m,t}$ is the market return and $R_{i,t}$ is the return of stock i at time t. The return of individual stock at time t is calculated as $R_{i,t} = (\ln(p_t) - \ln(p_{t-1})) \times 100$, where p_t and p_{t-1} is the closing price at time t and $t-1$, respectively.

Chang et. al., (2000) assert that under normal conditions, the relationship between return dispersions and market volatility, as determined by the rational asset pricing model, is linear. Therefore, an increase in the absolute value of the market returns will lead to a rise in the dispersions of individual investor returns. However, the notion behind this approach is that during periods of relatively large price movement, if market participants incline to make decisions based on aggregate market behavior, such increasingly linear relationship no longer holds; instead, it is more likely to be non-linear increasing or even decreasing. Thus, a negative and statistically significant of coefficient γ_2 in equation (1) will indicate the presence of this phenomenon in Damascus Security Exchange. We use OLS approach as the estimation to run the above regression model.

It is noticed that the herding coefficient of γ_2 in equation (1) is not under consideration of asymmetric effect arising from up and down markets. We further examine whether the degree of herd behavior is asymmetric in rising and falling markets. The following model which is modified by Chiang et. al., (2010) in spirit of Chang et. al., (2000) is applied:

$$CSAD_t = \gamma_0 + \gamma_1(1-D)R_{m,t} + \gamma_2 DR_{m,t} + \gamma_3(1-D)R_{m,t}^2 + \gamma_4 DRR_{m,t}^2 + \varepsilon_t \quad (3)$$

where, D is a dummy variable and D = 1 if R_m, $t < 0$, D = 0 otherwise.

The coefficients of γ_3 and γ_4 express the non-linear relationship between $CSAD_t$ and $R_{m,t}$ in under Bullish and Bearish markets, respectively. If $\gamma_3 < \gamma_4$, $CSAD_t$ in up market is smaller than in down market. As such, with the same level of volatility in market returns, the return dispersions will strongly decrease on days of down market vis-à-vis days of up market.

Quantile regression analysis (QREG) is an alternative estimator used besides OLS approach to investigate the asymmetry in rising and falling market. This additional analysis is utilized in order to provide more robust result. This quantile regression method has advantages over others in measuring the dispersions, especially in a non-stable environment. Moreover, it enables us to do the regression over the entire distribution of dependent variable to produce a more reliable result (Zhou & Anderson, 2011).

$$Q_r(\tau \mid X_t) = \gamma_{0,t} + \gamma_{1,t}|R_{m,t}| + \gamma_{2,t}R_{m,t}^2 + \varepsilon_t \quad (4)$$

In the spirit of test equation (3), quantile regression for measuring dependent variable $CSAD_t$ and a set of independent variables X_t, for τ quantiles are formularized as:

$$Q_r(\tau \mid X_t) = \gamma_{0,t} + \gamma_{1,t}(1-D)\,R_{m,t} + \gamma_{2,t}\,DR_{m,t} + \gamma_{3,t}\,(1-D)\,R_{m,t}^2 + \gamma_{4,t}\,DR_{m,t}^2 + \varepsilon_t \quad (5)$$

where, X_t is a vector of the right-hand-side variables; D is a dummy variable in which D = 1 if $R_{m,t} < 0$ and D = 0 otherwise.

4. EMPIRICAL RESULTS

A. Descriptive Statistics

Table 1 descriptive statistics for cross-sectional absolute deviation ($CSAD_t$) of returns, daily market returns ($R_{m,t}$), and Volume (V) are analyzed in terms of its mean for average return and standard deviation for volatility for Damascus Security Exchange from 2010 to 2017.

The mean for all variables are positive. The volume in 2012 is lowest due to the Syrian crisis, which affected the trading volume. The detailed results are reported in table 1. The graphs of Market return ($R_{m,t}$), Volume and $CSAD_t$ are shown below which indicate that $CSAD_t$ have more variations in year 2010. The detailed graph is shown in Figure 1.

Table 1
Descriptive Statistics

Variables	*Mean*	*Max*	*Min*	*Standard Deviation*	*Skewness*	*Kurtosis*
$R_{m,t}$	0.1223	3.80	–2.13	0.7779	1.27	6.71
$CSAD_t$	0.2362	5.55	0.00	0.3109	5.44	69.67
$V_{m,t}$	142,507.5	4,800,567	1	312,609.1	8.83	104.18

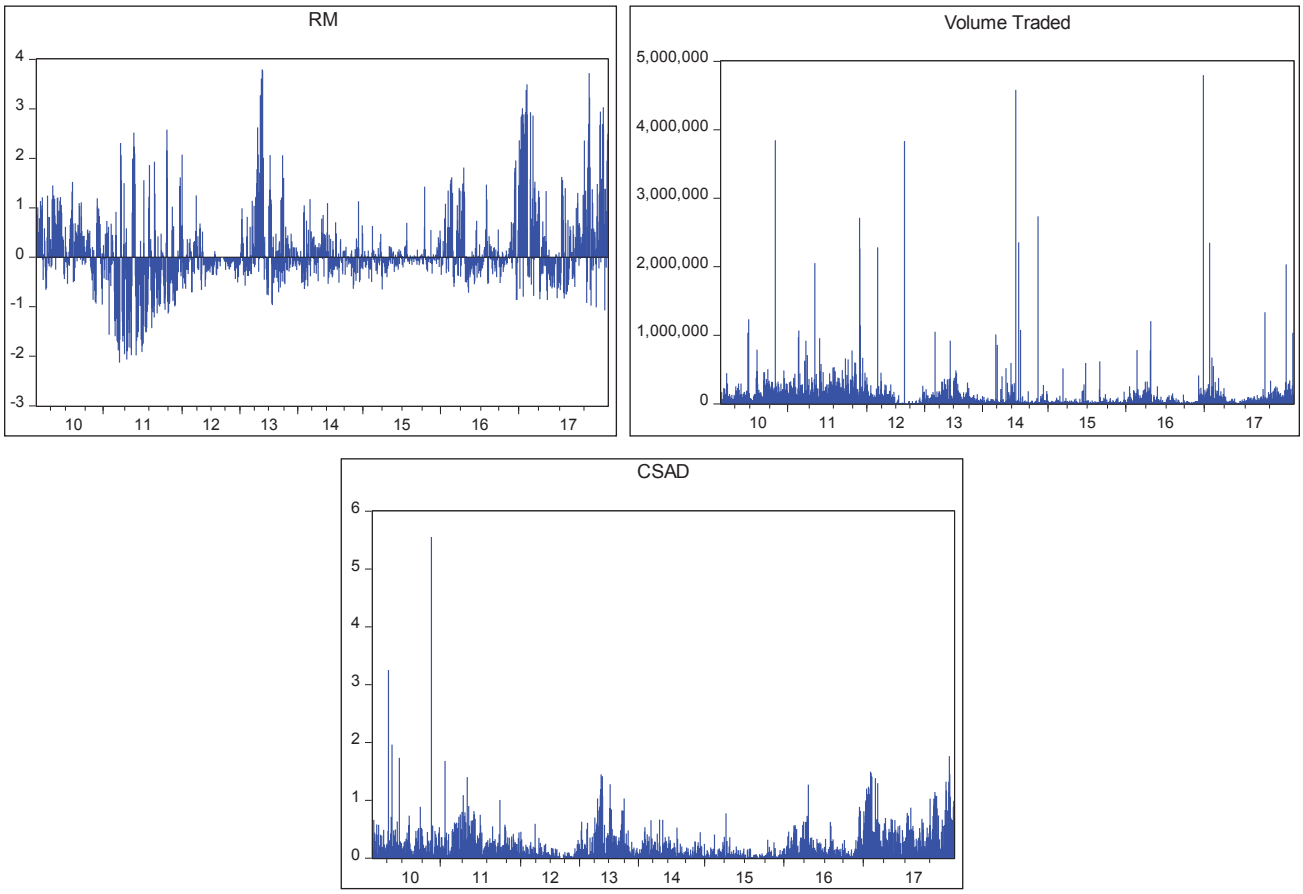

Figure 1: Graph of Market Return (Rm), Volume and CSAD
Source: **Eviews Program Outputs**

B. Regression Results

1. **Herding Results:** It is anticipated that a non– linear relationship will exist between return dispersion ($CSAD_t$) and market return squared ($R^2_{m,t}$) under abnormal conditions or market stress.

   This is due to fact that under abnormal conditions or market stress majority of the investors tries to follow the market and therefore return dispersion reduces. If γ_2 become significantly negative, it will be an indication of herding behavior.

   On the other hand, if γ_2 become insignificant or positive, it will show absence of herding behavior.

   Table 2 below shows the estimation results to analyze the existence of herding in Damascus Security Exchange.

Table 2
Regression Result of Herding in Damascus Security Exchange

Variables	*Coefficient*	*Z-Statistic*
γ_0	0.005570	1.174488
γ_1	0.507032	47.15867***
γ_2	–0.031094	–7.726541***
R-squared	0.389657	

Note: ***Denotes statistical significance at the 5% level.

   Our results show a negative and significant value on the coefficient γ_2, which indicate the evidence of herding. As such, the relationship between $CSAD_t$ and $R^2_{m,t}$ is square non-linear. In other words, there is evidence supporting the existence of herding in Damascus Security Exchange. Clearly, investors tend to follow market fluctuation and ignore their own private information when the stock market fluctuates strongly. This makes the variance between stock returns and market returns decrease, or unsystematical risk of individual stock nearly changes in market risk and dominates systematical risk. In brief, stock market participants have a tendency to observe and follow market consensus during the volatile period since they believe other investors have more precise signals.

2. **Herding Results under Bullish and Bearish Market:** Table 3 reports the results in rising and declining market where OLS is employed. Both coefficients of γ_3 and γ_4 are statistically significant and negative, Therefore, the results show that herd behavior exist in both bullish and bearish markets. In order to examine whether asymmetric effect exists in up and down markets, a Wald test is applied to investigate the equality of slopes. The results indicate there is a distinction in herding level between days when the market is up and days when the market is down.

3. **Quantile Regression Analysis Results:** The quantile regression method is used to consider different curves of independent variables against each quantile of dependent variable i.e $CSAD_t$. Table 5 presents the estimated results for using the quantile regression method. The results show that γ_2 is statistically significant and negative at the upper quantiles (τ = 75%, 90%). However, analysis does not find herding behavior in lower and median quantiles (τ = 10%, 25%, 50%).

Table 3
Regression Results of Herding in Rising and Declining Market by OLS Approach

Variables	*Coefficient*	*Z-Statistic*
γ_0	–0.002702	–0.594149
γ_1	0.452406	39.78943***
γ_2	–0.664443	–30.83167***
γ_3	–0.015560	–3.275033***
γ_4	–0.214237	–13.91391***
R-squared	0.422924	
	Wald coefficient test	
	H0: $\gamma_3 - \gamma_4 = 0$	
F-statistic	169.7547	
p-value	0.0000	
$\gamma_2 - \gamma_4$	–0.198677	

Note: ***Denotes statistical significance at the 5% level.

Therefore, a conclusion can be draw that herding exists in upper quantiles but did not exist in lower quartiles during the sample period. This may be due to herd behavior by the investors for the return dispersions at the upper tail of the return distribution. Therefore, during market stress, herding occur in upper quantiles. The detailed results are reported in Table 4.

Table 4
Quantile Regression Results

Quantile	γ_0	γ_1	γ_2	*Pseudo* R^2
$\tau = 10\%$	0.001789 (0.684340)	0.062085 (3.514918)***	0.058718 (9.233324)***	0.160556
$\tau = 25\%$	0.006981 (2.448270)***	0.211621 (11.55946)***	0.025295 (2.848443)***	0.261806
$\tau = 50\%$	0.017774 (4.736983)***	0.399972 (14.40731)***	–0.013462 (–0.656087)	0.381662
$\tau = 75\%$	0.055618 (7.869027)***	0.499712 (21.19935)***	–0.032047 (–3.893580)***	0.441977
$\tau = 90\%$	0.149013 (8.585710)***	0.564274 (11.24719)***	–0.046689 (–2.686545)***	0.441402

Note: ***Denotes statistical significance at the 5% level.

4. **Comparison of Results of OLS and Quantiles Regression:** Results in Table 4 show that the estimated coefficients and significance levels differ with the quantile levels. The comparison of results between quantile regression and conventional least squares method is necessary to analyze the difference in the two methodologies. The results of conventional least squares method show that the coefficients on γ_2 are significant and negative for the sample period. The results of quantiles regression analysis show that herding exists in the upper ($\tau = 75\%, 90\%$) quantiles but not in lower ($\tau = 10\%, 25\%$) quantiles.

Therefore, the quantile regression method is superior in analyzing the relationship between return dispersions (dependent variable) and market returns (independent variables). Our results also confirm this and show that herding is more visible at the upper quantiles of the return dispersions. This is due to the fact that the quantiles regression analysis is robust in finding the existence of outlier.

Our results in median i.e. 50% are different from OLS method which is due to skewness of data. Another important fact is that a non–linear relationship will exist between return dispersion (CSAD) and market return squared under abnormal conditions or market stress. This is due to the fact that under abnormal conditions or market stress majority of the investors tries to follow the market and therefore return dispersion reduces. Therefore, herding behavior is more evident in the lower tail of stock return or extreme of stock return.

5. **Quantile Regression Analysis Results under Bullish and Bearish Market:** Table 5 presents the results in each period using the quantile regression method. The estimates suggest that both coefficients γ_3 and γ_4 are negative and statistically significant in quantiles ($\tau = 75\%, 90\%$). In the quantiles ($\tau = 10\%, 25\%, 50\%$), we observe that the herding coefficient is positive on days when the market is down.

In general, the insignificance of this phenomenon for cases in lower quantiles reflects the fact that herding activity is less likely to occur for the return dispersions at the lower tail of the distribution. It also reveals that investors display more homogeneous trading behavior, particularly on days when the market is elevated.

We further examine the equality of slopes by employing the Wald test. The last column in Table 5 shows the estimated statistics and indicates that the null hypothesis ($\gamma_3 - \gamma_4 = 0$) is uniformly rejected at all quantile distributions throughout the period studied. In other words, there is a difference in the herding level in rising market and falling market. The detailed results are reported in Table 5.

Table 5
Analysis of Herding in Rising and Falling Market by Quantile Regression Estimator

								Wald Test
Variables	γ_0	γ_1	γ_2	γ_3	γ_4	R^2	*F-statistic*
Quantile ($\tau = 10\%$)	–1.96E-18 (–6.82E-16)	0.059151 (2.472829)***	–0.153194 (–5.078524)***	0.060316 (8.092860)***	–0.028517 (–1.322924)	0.176518	17.14815 0.0000
Quantile ($\tau = 25\%$)	0.000265 (0.089458)	0.228208 (10.16790)***	–0.336207 (–12.61304)***	0.027307 (2.557532)***	–0.111733 (–5.693861)***	0.278872	43.10985 0.0000
Quantile ($\tau = 50\%$)	0.012593 (4.276957)***	0.414578 (24.14653)***	–0.468856 (–17.27115)***	–0.011997 (–1.540294)	–0.102722 (–4.130080)***	0.389972	12.89111 0.0003
Quantile ($\tau = 75\%$)	0.049447 (7.516382)***	0.514690 (20.47902)***	–0.573975 (–15.45318)***	–0.035823 (–3.897925)***	–0.102203 (–4.733365)***	0.445994	9.313311 0.0023
Quantile ($\tau = 90\%$)	0.134683 (8.285300)***	0.563148 (10.21226)***	–0.756937 (–10.11353)***	–0.043275 (–2.122717)***	–0.213378 (–5.761636)***	0.449031	20.36992 0.0000

Note: ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.

6. **Comparison of Results of OLS and Quantiles Regression under Bullish and Bearish Market:** The results in Table 5 show different estimated coefficients at different quantile levels. The comparison of results between quantile regression and conventional least squares method under bullish and bearish markets is necessary to analyze differences in the two methodologies. Conventional least squares method under bullish and bearish markets find herding both under bullish and bearish markets, When applying quantile regression approach we find different results of herding in the lower (10%, 25% and 50%) and upper (75% and 90%) quantiles. The reason is OLS approach focuses on mean as a measure of location, while the quantile regression analysis allows the author to compute a family of regression curves, each corresponding to a different quantile of the conditional distribution of the dependent variables (Chiang et. al., 2010). Further, quantile regression provides a much more overall picture of the conditional distribution between return dispersions and independent variables.

5. CONCLUSION

This paper reports the presence of herd behavior in Damascus Security Exchange (DSE) by investigating the non-linear relationship between stock return dispersions and market returns. The regression results show that investors display herding behavior. The study also examines herding under bullish and bearish market conditions. The results show herding evidence in both bullish and bearish markets. This study further tests the herding equation by using a quantile regression model, which is superior to ordinary least square (OLS) method and uses different quantiles of the return dispersion. The results of quantile regression show that herd behavior is more dominant in the upper tail of the dispersion of return. When quantile regression is used in bullish and bearish markets herding exists under upper quantile (75%, 90%).

These results have significance for both policy makers and investors. The herding in the stock market is due to the imperfection of the Damascus Security Exchange and its regulator should take action by introducing reforms and strict regulations for efficient control of the market. The following step should be taken to avoid herding in Damascus Security Exchange in future.

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