Herding Behaviour before and after the Tunisian Revolution

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***Abstract*– In this paper, we examine the presence of herding behaviour of market participants in the Tunisian Stock Exchange (TSE) using daily data before and after the Tunisian revolution. Applying the methodology of Christie and Huang (1995), we report no evidence of herding behaviour in the TSE before and after the Tunisian revolution. We find that equity return dispersions tend to increase rather than decrease during periods of extreme market movements. Moreover, using the methodology of Chang et *al.* (2000), we document that investors do not exhibit herding before the Tunisian revolution. However, we find evidence of a weak herding behaviour after the Tunisian revolution.**

***Keywords*– Herding Behavior, Tunisian Revolution and Tunisian Stock Exchange**

I. INTRODUCTION

Herding behaviour in equity markets has been described as an obvious intent by investors to suppress their private information and copy the actions of other investors. Herding behaviour has attracted the attention of practioners and academics over the past decade. Practioners are interested in whether investors in equity markets imitate others, because the reliance on aggregate information rather than personal information may cause asset prices to diverge from equilibrium value and destabilize markets. Academics are also interested by the existence of herding behaviour in equity markets, because the affiliated behavioural bias on equity price movements may influence their return and risk characteristics, and hence have repercussions for asset pricing models.

Several reasons have been suggested to explain the presence of herding behaviour in financial markets. First, investors mimic the actions of others investors because they have an inherent preference for similarity with the market consensus (Devenow and Welch 1996). Second, investors think that others investors may be more informed about the returns on the specific investment and their actions communicate this information (Avery and Zemsky 1998; Calvo and Mendoza 2000). Finally, managers suppress private information and trade with the crowd in order to preserve their reputation in the market (Scharfstein and Stein 1990; Rajan 1994).

There are little empirical studies testing the presence of herding behaviour of market participants in the Tunisian Stock Exchange (TSE) (Boubaker and Bouattour 2008; Naoui and Khaled 2010). However up to now, there is no published study examining herding behaviour in the TSE before and after the Tunisian revolution that began on December 17, 2010 and ended on January 14, 2011. Therefore, the purpose of this study is to test the presence of herding behaviour on the part of market participants in the TSE using daily data before and after the Tunisian revolution.

Applying the methodology of Christie and Huang (1995), we find no evidence of herding behaviour in the TSE before the Tunisian revolution (2 January 2009 – 16 December 2010) and after the Tunisian revolution (31 January 2011[1]– 30 November 2012). We find that equity return dispersions tend to increase rather than decrease during periods of extreme market movements. Moreover, using the methodology of Chang et *al.* (2000), we document that investors do not exhibit herding before the Tunisian revolution. However, we find evidence of a weak herding behaviour after the Tunisian revolution.

This paper continues as follows. Section 2 reviews previous studies on the herding behaviour. Section 3 presents data and methodologies. Section 4 reports empirical results. Finally, section 5 offers a brief conclusion.

II. PREVIOUS STUDIES ON THE HERDING BEHAVIOUR

Herding behaviour has examined in various stock markets. Christie and Huang (1995), using daily and monthly returns on US stocks, reported no evidence of herding on the part of market participants (equity return dispersions increasing during periods of market stress). Chang et *al.* (2000) also documented no evidence of herding phenomenon in the US, Hong Kong and Japan markets. They found that equity return dispersions tended to increase rather than decrease during periods of extreme market movements. Furthermore, Henker et *al.* (2006), applying the Christie and Huang (1995) and the Chang et *al.* (2000) methodologies, found no evidence of herding behaviour in the Australian stock market from 2001 and 2002. However, Cajueiro and Tabak (2009) documented significant evidence of herding behaviour in the Japanese stock market over the period from 4 January, 2000 to 9 February, 2006. Herding behaviour has been investigated not only in developed markets, but also in emerging markets. Chang et *al.* (2000) reported evidence of herding behaviour in emerging markets of Taiwan and South Korea. They found

that equity return dispersions tended to decrease during periods of extreme up and down movements. Using the methodology of Chang et *al.* (2000), Tan et *al.* (2008) also found that investors exhibit herding in the Shanghai stock market from July 1994 to December 2003. However, other empirical studies revealed the absence of herding behaviour in emerging markets. Boubaker and Bouattour (2008) applied the Christie and Huang (1995) and the Chang et *al.* (2000) methods to examine herding in the TSE. They used daily stock returns data from 1997 to 2005 and found a higher level of dispersion around the market during periods of extreme market movements, evidence against herding. Naoui and Khaled (2010), using the methodology of Chang et *al.* (2000) also found no evidence of herding on the part of market participants in the TSE between January 2006 and December 2008. Furthermore, Demirer and Kutan (2006), applying the methodology of Christie and Huang (1995) found no evidence of herding in Chinese stock markets over the period from January 1999 to December 2002.

Many empirical studies have examined the herding behaviour of market participants before, during and after crises. Choe et al. (1999) investigated the presence of herding behaviour of foreign investors in the Korean equity market before and during the Asian crisis of 1997. They found that herding behaviour is smaller during the crisis period. Also, Kim and Wei (2002) studied the existence of herding behaviour of foreign investors in the Korean equity market during and after the Asian crisis. They documented that foreign investors exhibit high herding behaviour after the Asian crisis. Furthermore, Hwang and Salmon (2004) found more evidence of herding behaviour before the Russian crisis of 1998 than during the crisis period in the USA and UK stock markets. Economou et al. (2011) documented evidence of herding phenomenon in the Italian, Spanish, Portuguese and Greece markets before and after the 2008 global financial crisis. Al-Shboul (2013) studied the existence of herding behaviour in the Jordanian stock market before and after the 2008 global financial crisis. Using the Christie and Huang (1995) method, he found that Jordanian investors do not exhibit herding behaviour before and after the crisis. However, applying the Chang et *al.* (2000) method, he reported evidence of herding behaviour only before the crisis.

III. DATA AND METHODOLOGIES

A. *Data*

Our data contain daily closing prices and dividends for all companies listed on the TSE before the Tunisian revolution (2 January 2009 – 16 December 2010) and after the Tunisian revolution (31 January 2011 – 30 November 2012). All data are collected from the web page of the TSE (www.bvmt.com.tn). The daily return of stock i is given by:

$$r_{i,t} = \frac{P_{i,t} - P_{i,t-1} + DIV_{i,t}}{P_{i,t-1}} \qquad (1)$$

Where, $P_{i,t}$ is the closing price of stock i on day t, $P_{i,t-1}$ is the closing price of stock i on day t-1 and $DIV_{i,t}$ is the dividend of stock i on day t.

B. *Methodologies*

In order to examine the existence of herding behaviour in the TSE before and after the Tunisian revolution, we use the Christie and Huang (1995) and the Chang et *al.* (2000) methodologies. Christie and Huang (1995) employ the cross-sectional standard deviation of returns (*CSSD*) as a measure of return dispersion to detect herding behaviour in stock market. The *CSSD* measure is defined as:

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

Where n is the number of companies in the portfolio, $r_{i,t}$ is the observed return of company i at period t and $R_{m,t}$ is the cross-sectional average of the n returns in the portfolio at period t. Christie and Huang (1995) suggest that during normal periods, the dispersion of asset returns will increase with the absolute value of market return since individual asset returns differ in their sensitivity towards the market return. However, during periods of market stress, investors tend to ignore their own beliefs and found their investment decisions only on the market movements. Individual asset returns under these conditions will not diverge too far from the market average. Thus, they argue that herding behaviour will be more pronounced during periods of extreme market movements.

They use the following regression:

$$CSSD_t = \alpha + \beta^L D_t^L + \beta^U D_t^U + \varepsilon_t \qquad (3)$$

Where $CSSD_t$ is the cross-sectional standard deviation of returns at period t. D_t^L and D_t^U are dummy variables at period t. D_t^L takes the value 1, if the market return at period t lies in the extreme lower tail of the return distribution and zero otherwise, and D_t^U takes the value 1, if the market return at period t lies in the extreme upper tail of the return distribution; zero otherwise. This model suggests that in the presence of herding behaviour, individual asset returns will not diverge too far from the market average. Thus, the existence of negative and statistically significant β^L and β^U coefficients would be indicative of herding behaviour.

In order to detect the existence of herding behaviour in stock markets, Chang et *al.* (2000) suggest an alternative, less stringent method to the one proposed by Christie and Huang (1995). They use the cross-sectional absolute deviation (*CSAD*) to measure the return dispersion:

$$CSAD_t = \frac{\sum_{i=1}^{n}|r_{i,t} - R_{m,t}|}{n} \qquad (4)$$

In the presence of herding behaviour (where investors ignore their own private information and found their investment decisions only on the market movements), individual asset returns will not diverge too far from the market average. Rational asset pricing models predict that the dispersion of asset returns will increase linearly with the absolute value of market return since individual asset returns differ in their sensitivity towards the market return. Therefore,

Chang et *al.* (2000) argue that the $CSAD_t$ by itself cannot be employed to capture herding behaviour. Rather, the relationship between the $CSAD_t$ and $R_{m,t}$ should be investigated. When herding behaviour is present, $CSAD_t$ increases at a nonlinear (decreasing) rate as the absolute market return $|R_{m,t}|$ increases, i.e. $CSAD_t$ deviates downwards from the linear relationship. Furthermore, as herding behaviour was presumed to be more pronounced during periods of extreme price movements (Christie and Huang (1995)), these deviations are expected to be larger for higher values of $|R_{m,t}|$. Thus, to examine the presence of herding behaviour of market participants, the following regression is estimated:

$$CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t \quad (5)$$

The first two terms on the right-hand side of the regression (5) determine the linear relation between the cross-sectional return dispersion and the market return. The presence of a negative and statistically significant γ_2 coefficient would be indicative of herding behaviour. When, the γ_2 coefficient is statistically insignificant, $CSAD_t$ increases linearly with the absolute value of the market return, and we conclude that herding behaviour is not present in equity market.

IV. EMPIRICAL RESULTS

A. Descriptive statistics

Table 1 reports the descriptive statistics of the daily market returns, the *CSSD* of returns and the *CSAD* of returns before and after the Tunisian revolution. As shown in table 1, before the Tunisian revolution, the daily market returns have positive mean. However, after the Tunisian revolution, they have negative mean. Before and after the Tunisian revolution, the kurtosis coefficient for daily market returns is positive; while skewness is negative (i.e. the series is left-skewed). Therefore, the market return shows excess kurtosis (i.e. the series is leptokurtic), implying fatter tails than a normal distribution. On the other hand, before and after the Tunisian revolution, the *CSAD* of returns and the *CSSD* of returns have positive mean, kurtosis coefficient and skewness. Due to the existence of excess kurtosis, both series are non-normal (at 1% level) by means of the Jarque-Bera statistics.

B. Dummy variable regression results

Table 2 presents results of the regression (3). We use five percent of the observations in the lower and upper tail of the market return distribution to define extreme market return. From this table, we see that the explanatory power of the Christie and Huang (1995) model is higher before the Tunisian revolution than after the Tunisian revolution. The adjusted R^2 values before and after the Tunisian revolution are 21% and 8% respectively. From table 2, we also note that before and after the Tunisian revolution, the β^L and β^U are not significantly negative, indicating that return dispersions increase during periods of extreme market movements. This result is consistent with the absence of herding behaviour before and after the Tunisian revolution and supports the rational asset pricing models that predict that during periods of market stress, the dispersion of asset returns will increase with the absolute value of market return since individual asset returns differ in their sensitivity towards the market return. Our results are similar to results found by Boubaker and Bouattour (2008) and Naoui and Khaled (2010), who also report no evidence of herding behaviour in TSE.

C. Examining the nonlinearity in the $CSAD - R_m$ relationship

Table 3 provides results of the regression (5). From this table, we see that the explanatory power of the Chang et *al.* (2000) model is higher before the Tunisian revolution than after the Tunisian revolution. The adjusted R^2 values before and after the Tunisian revolution are 76% and 21% respectively. From table 3, we also note that, before the Tunisian revolution, the coefficient on the linear term of $|R_m|$ is positive and statistically significant. The result supports the prediction that $CSAD_t$ increases with $|R_{m,t}|$. Moreover, the γ_2 coefficient is significantly positive, indicating that market participants in Tunisian equity market do not exhibit herding and make investment choices rationally. Also, after the Tunisian revolution, we find that the γ_1 coefficient is positive and statistically significant. The result supports the prediction that $CSAD_t$ increases with $|R_{m,t}|$. However, the γ_2 coefficient is negative and statistically significant at the 10% level, indicating the presence of a weak herding behaviour in the TSE. In other words, the $CSAD_t$ increases at a nonlinear (decreasing) rate as the absolute market return $|R_{m,t}|$ increases. The existence of a weak herding behaviour on the part of market participants after the Tunisian revolution can be explained by the instability of the socio-political situation and the lack of visibility on the evolution of the national economy.

V. CONCLUSION

In this paper, we investigate the presence of herding behaviour of market participants in the TSE using daily data before and after the Tunisian revolution. Applying the methodology of Christie and Huang (1995), we document no evidence of herding behaviour in the TSE before and after the Tunisian revolution. We report that equity return dispersions tend to increase during periods of extreme up and down movements. Moreover, using the methodology of Chang et *al.* (2000), we document that investors do not exhibit herding before the Tunisian revolution. However, we find evidence of a weak herding behaviour after the Tunisian revolution. This result can be explained by the instability of the socio-political situation and the lack of visibility on the evolution of the

national economy that characterize the period after the Tunisian revolution.

In general, our findings suggest that before and after the Tunisian revolution, herding behaviour is not a preponderant factor in determining asset returns during periods of extreme market movements. An important extension of this paper would be to test the presence of herding behaviour in the TSE before and after the Tunisian revolution using sector-level data.

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NOTE:

1. Between 15/01/2011 and 30/01/2011, the TSE is closed.

Table 1: Descriptive statistics of market returns ($R_{m,t}$), cross-sectional standard deviations ($CSSD_t$) and cross-sectional absolute deviation ($CSAD_t$)

	Before the Tunisian revolution			After the Tunisian revolution		
	$R_{m,t}$	$CSSD_t$	$CSAD_t$	$R_{m,t}$	$CSSD_t$	$CSAD_t$
Mean	0.0006	0.0208	0.0125	-8.51E-05	0.0182	0.0120
SD	0.0062	0.0254	0.0070	0.0060	0.0087	0.0036
Skewness	-2.6681	9.9457	8.2143	-0.0112	5.2668	1.6051
Kurtosis	20.3301	110.8455	86.9179	8.8487	44.0757	7.4003
J.B-test	6713.13***	245537.4***	149289.3***	652.80***	34315.05***	566.17***

Note: *** denotes significance at the 1% level.

Table 2: Regression results of the daily cross-sectional standard deviation on the market dummy variables

	Before the Tunisian revolution	After the Tunisian revolution
α	0.0181***	0.0177***
	(16.89)	(43.17)
β^L	-0.0016	-0.007
	(-0.36)	(-0.37)
β^U	0.0531***	0.0113***
	(11.44)	(6.37)
Adjusted R^2	0.21	0.08

Note: *** denotes test statistic significance at the 1% level.

Table 3: Regression results of the daily cross-sectional absolute deviation on the linear and squared term of the market return

	Before the Tunisian revolution	After the Tunisian revolution
α	0.0105***	0.0102***
	(39.96)	(40.14)
γ_1	0.1857***	0.4976***
	(2.81)	(6.31)
γ_2	32.7059***	-6.3419*
	(17.30)	(-1.81)
Adjusted R^2	0.76	0.21

Notes: * and *** denote test statistic significance at the 10% and 1% levels, respectively.