Profitability of the Momentum Strategies in the Tunisian Stock Market

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Abstract

This paper examines the profitability of the momentum strategies in the Tunisian stock market using all the listed firms for the period 1991-2015. The stock performance is measured by the returns and the cumulative abnormal returns during a formation and holding period of 3-12 months. We found evidence of momentum profitability especially for the sub-period 2003-2015. Buying the tercile or the quintile portfolio of stocks that have performed well in the past 3, 6 and 9 months and selling the tercile or quintile of the stocks that have performed poorly during the same periods, generate statistically and economically positive returns during the subsequent 3, 6, 9 and 12 months.

1. Introduction

Challenging the efficient market hypothesis, several empirical studies show that past stock prices help predict future stock prices. The momentum effect is one of the stock market anomalies described as "embarrassing" to this hypothesis. It means that stocks that have performed well in terms of stock returns during a short period continue to generate the same performance; and stocks with relatively poor performance also continue to suffer poor performance. Selling losing stocks and buying winning ones, called momentum strategy,

generates a positive return. The profitability of this strategy is documented in developed as well as in emerging markets all over the world.

The majority of studies dealing with the momentum effect have been carried out in developed markets where the American market seizes the largest share, either in terms of pioneering work or in terms of quantity. The first evidence comes from the pioneering work of Jegadeesh and Titman (1993) on the New York Stock Exchange (NYSE) and American Mercantile Exchange (AMEX) over the period 1965-1989. They found that the decile portfolio of the stocks having the highest returns continue to outperform the decile of stocks having lower returns for a formation and holding period ranging from 3 to 12 months. Similar results were reported by Bulkley and Nawosah (2008), Chordia and Shivakumar (2002), Simlai (2011) and Arena et al. (2008) in the same market. Maskowitz and Grinblatt (1999) developed an industry momentum strategy based on the sectors of firms' activity. They found that this type of momentum outperforms the classical momentum strategy based on individual stocks. Min and Kim (2016) found that the momentum strategies generate negative returns in bad states of the world when the market risk premium is high and positive returns in the case of good states of nature when the risk premium is low.

The momentum effect was found in other developed markets. For example, using daily data of 446 listed firms in the Frankfurt Stock Exchange (Germany) over the period from June 1988 to July 2001, Glaser and Weber (2001) found that the momentum effect is prominent for stocks having high turnover. In the Canadian market, Hou and Mcknight (2004) revealed the existence of the momentum effect over the period 1988-2000. Evidence of the momentum effect was also provided by Antoniou et al. (2006) and Hon and Tonks (2003) in the London stock market using a sample of 2556 British firms for the period 1993 – 2002 and a sample of 6600 firms over the period 1955-1996, respectively. In the Japanese market, Teplova and Mikova (2015) found that the momentum strategy is not robust since it does not work for the period 1997 - 2013. Demir and al. (2004) reported an important momentum effect for small capitalization firms.

International evidence of momentum effect was provided by Rouwenhorst (1998) using 2190 firms from 12 European countries over the period 1978-1995. They found results that confirm those of Jegadeesh and Titman (1993) in the US market. Specifically, an internationally diversified winner portfolio outperforms the relatively loser portfolio by 1% per month. Further international evidence was given by Fama and French (2012) who examined the phenomenon in 23 countries belonging to four regions (North America, Europe, Japan and Asia Pacific) for the period ranging from November 1989 to March 2011. They found that the momentum effect exists in all the markets except in Japan. Huynh and Smith (2013) considered a weekly frequency of momentum returns in 4 regions (United States, Europe, Japan and Asia Pacific). They found that the momentum effect is mainly explained by the underreaction to news.

Evidence of momentum effect was also documented in emerging markets. For example, Cakici et al. (2013) analyzed data of 18 emerging countries in three regions (Asia, Latin America and Eastern Europe) and found a momentum effect in the three regions over the

period 1990-2011 except in Eastern Europe. Anusakumar et al. (2012) studied 13 Asian countries including 5 developed countries (Hong Kong, Japan, Singapore, Korea, Taiwan) and 8 emerging countries (Bangladesh, China, India , Indonesia, Malaysia, Pakistan, Philippines and Thailand) for the period 2000-2011. They observed that the momentum effect is absent for the periods characterized by a sentiment of pessimism and appears in optimistic periods. Bornholt et al. (2015) found that for the period 1995-2009, the momentum strategy seems to be more profitable in 34 out of 37 developed and emerging countries in case it is based on the past trading volume. The momentum strategy yields on average 0.85 % per month across the countries. Ejaz and Polak (2015) tested the existence of the short-term momentum effect in 6 countries of the Middle East over the period 2008-2013 and found results confirming this anomaly. In India, Polak and Ejaz (2012) examined 4900 companies listed on Bombay Stock Exchange for the period going from June 2006 to June 2011 and found a short term momentum effect. A momentum strategy yields, on average, a monthly return of 12.05%. Nguyen (2012), and Alphonse and Nguyen (2013) gave evidence of momentum effect in the Vietnamese market using weekly returns. Similar evidence was found in Iran by Khosroazad and Chitsazan (2016) using a sample of 40 firms listed in the Tehran Stock Exchange during the period 2004-2014. Sakr et al. (2014), considering a sample of 48 companies listed on the Egyptian market for the period 2004-2010, concluded, however, that this anomaly does not exist in this market. In China, Li et al. (2010) also found no evidence of momentum effect for the period January 1994-2007; however, using a transaction database of 13460 Chinese investors and firms for the period 2001-2004, Shumway and Wu (2006), found that the momentum is profitable in China. Such a strategy yields, on average, 7% per year.

Based on this literature review, we deduce that the momentum effect does not seem to be limited to a few markets; it rather has an international character. Believing that the Tunisian stock market is not an exception, we expect this effect to be present in the Tunis stock exchange.

In order to contribute to the literature on emerging markets, we examine the momentum effect and the profitability of its strategy in the Tunisian stock market. Applying two different criteria, two approaches will be adopted to evaluate the stock performance: The approach of De Bondt and Thaler (1985) and that of Jegadeesh and Titman (1993). The remainder of the paper is organized as follows. Section 2 presents the data and details the empirical methodology. Section 3 analyses our empirical results. Section 4 concludes the paper.

2. Research Design

2.1 The Data

We collect the end of month stock prices and the dividends of all the firms listed in the Tunisian stock market[1] during the period January 1991 to December 2015 from the web site of the Tunis stock exchange (www.bvmt.com.tn). During the 25 years covering our sample

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[1] A brief description of the Tunis stock Exchange is provided by Boussaidi and Abaoub (2016).

period, the number of stocks had increased from 15 in 1991 to 80 in 2015 (the firms are presented in the Appendix). Considering a rebalanced sample has the advantage of obtaining results that reflect the entire stock market.

2.2 Construction of the Momentum Strategies

To examine whether the momentum effect exists in the Tunisian stock market and whether it generates profitable returns, we refer to two-widely-used pioneering approaches: the approach of De Bondt and Thaler (1985) which uses the stock Cumulative Abnormal Return as a performance criterion, and the methodology of Jegadeesh and Titman (1993) which uses simply the return as a stock performance criterion.

Stocks are ranked in descending order based on their past performance measured by returns (Jegadeesh and Titman, 1993) or cumulative abnormal returns (De Bondt and Thaler, 1985) over a period of time called the formation period and assigned to three or five portfolios. Constructing terciles or quintiles portfolios instead of deciles is suitable in the Tunisian context because the number of listed firms is relatively low compared to developed markets. The tercile (or quintile) of stocks having the best performance is called winner portfolio (*W*), however, the tercile (or quintile) of stocks having the worst performance is called loser portfolio (*L*). If the number of stocks is not perfectly divisible by 3 or 5, it will be rounded to the nearest integer to ensure that the extreme portfolios have the same number of stocks. In our study, we focus only on the extreme portfolios *W* and *L*. The performance of the extreme portfolios is then tracked over the next period known as "holding period" or "test period".

In order to detect the period when the momentum effect occurs in the Tunisian stock market and to determine the most profitable strategy, we consider four formation periods and four holding periods of 3, 6, 9 and 12 months. The combination of the two periods yields 16 strategies: (3/3), (3/6), (3/9), (3/12), (6/3) ... (12/12). A momentum strategy selects stocks based on their returns of the past *f* months and holds them for the next *h* months. Specifically, it sells the loser tercile (or quintile) and buys the winner tercile (or quintile). We refer to such strategy as a (*f/h*) strategy. For each formation period we consider stocks having sufficient number of observations. For example, for a formation period of 6 months we only consider stocks having 6 monthly-return observations.

2.2.1 The Methodology of De Bondt and Thaler (1985)

We compute the continuously-compounded monthly return of each stock *i* as the natural logarithm of the end of month *t* stock price adjusted for dividends to the end of month *t-1* stock price:

$$R_{i,t} = Ln\left(\frac{P_{i,t} + D_{i,t}}{P_{i,t-1}}\right) \qquad (1)$$

Where, $P_{i,t}$ is the closing price of stock *i* at the end of month *t* , $D_{i,t}$ is the dividend distributed between *t-1* and *t*, and *Ln* is the natural logarithm.

We, then, compute for each stock the excess return as the difference between the stock return

and the market return where the latter is the equal-weighted return of all the stocks in the sample. The excess returns for a period of f months are summed to get the cumulative abnormal returns.

At the end of each formation period (t = 0) we form the extreme portfolios W and L based on the Cumulative Abnormal Returns (CAR) criterion, as detailed above. To track the performance of each extreme portfolio during the holding period, we compute the average abnormal returns in the month t (t> 0) as the equally-weighted abnormal returns of the stocks composing it.

$$AR_{P,t} = \frac{1}{n} \sum_{i=1}^{n} AR_{i,P,t} \qquad ; \; P \; = \; W \; \text{ou} \; L \qquad (2)$$

Where n is the number of stocks in each portfolio. If the stock's return is missing during the test period because the firm was delisted during that period, the stock will be dropped from the portfolio. In this case, the average abnormal return is calculated based on the available abnormal returns.

Then, the average residual return of each portfolio is summed over the holding period to get the Cumulative Average Residual Return:

$$CAR_{P,t} = \sum_{t=1}^{h} AR_{P,t} \qquad \text{Where, P = W or L} \qquad (3)$$

Finally, for M holding periods, the Cumulative Average Residual Returns are averaged to get the Average Cumulative Abnormal Return, $ACAR$:

$$ACAR_{P,t} = \frac{1}{M} \sum CAR_{P,t} \qquad (4)$$

In our tests we adopt the method of overlapping intervals. For example, for a 12-month formation period and a 12-month holding period, the extreme portfolios are constructed based on the CAR of the 12-month sub-periods January 1991-December 1991, January 1992-December 1992, January 1993-December 1993, and so on, until January 2014-December 2014; Then their performance is checked over the next 12 months, i.e. January 1992-December 1992, January 1993-December 1993, January 1994-December 1994, and so on, until January 2015-December 2015.

2.2.2 Methodology of Jegadeesh and Titman (1993)

At the end of each month t from July 2004 to December 2015, stocks are ranked in a descending order based on their continuously compounded returns for a formation period of 3, 6, 9 and 12 months. The extreme portfolios are, then, constructed as detailed above. The two portfolios are reconstructed each month and the return on each one of them is the equal-weighted returns of the n stocks composing it. The performance of the extreme

portfolios is tracked during the next 3, 6, 9 and 12 months (the holding period).

For example, for a strategy (12/12) which picks stocks based on the returns over the previous 12 months and holds them for the next 12 months, stocks are sorted according to their past returns during the sub-periods January 1991-December 1991, February 1991-January 1992, March 1991-February 1992, April 1991-March 1992, and so on until January 2014-December 2014. Thereafter, their performance is evaluated during the following 12 months: January 1992-December 1992, February 1992-January 1993, March 1992-February 1993, April 1992-March 1993, and so on until January 2015-December 2015, respectively. In this case, the number of observations is 277.

The momentum strategy buys the winner portfolio and sells the loser one, each month, and holds this position for the next h months. The return generated by this strategy is the return on the winner portfolio minus the return on the loser one. Similarly to Jegadeesh and Titman (1993), we revise the weights on 1/h of the stocks in the entire portfolio in each month during the holding period.

The methodology of Jegadeesh and Titman (1993) differs from that of De Bondt and Thaler (1985) in two points: It selects stocks based on their returns and it reconstructs the momentum strategy in each month. The advantage of this methodology is that it offers a high number of observations. For example, for the strategy (3/3) we obtain 99 *ACAR* observations (or replications) with the methodology of De Bondt and Thaler (1985), while with the methodology of Jegadeesh and Titman (1993) we obtain 295 *return* observations. For the strategy (6/6), we obtain 49 and 289 observations, respectively; whereas for the (12/12) strategy we obtain 24 and 277 observations, respectively.

2.3 Hypothesis

The weak form of the efficient market hypothesis means that the future stock prices are not predictable from past prices because the prices reflect instantaneously all the available information. However, the momentum effect supposes a past performance continuation so that future returns can be deduced from past returns. Under this hypothesis, we expect therefore that during the holding period, $ACAR_{W,t}$ (or $R_{W,t}$) is significantly positive and $ACAR_{L,t}$ (or $R_{L,t}$) is significantly negative. The momentum strategy consists in selling the loser portfolio and buying the winner one. The momentum profits measured by the difference between $ACAR_{W,t}$ and $ACAR_{L,t}$ or the difference between $R_{W,t}$ and $R_{L,t}$ should be significantly positive.

3. Empirical Results

We begin our analysis with the results obtained from the methodology of De Bondt and Thaler (1985). Table 1 displays the average cumulative abnormal returns (ACAR) of the loser (L), the winner (W) and the arbitrage (W-L) portfolios at the formation date (t = 0) and the end of each holding period.

At the formation date, obviously, $ACAR_L$ is negative and $ACAR_W$ is positive indicating that the winner portfolio outperforms the loser one at that date, which results in a significantly

positive difference. This is because the loser portfolio is already composed of stocks having the worst returns over the formation period; while the winner portfolio is already composed of stocks having the best returns during the same period.

Table 1. Average Cumulative Abnormal Return of the winner, Loser and winner minus loser portfolios for different strategies: Full sample period January 1991-December 2015

	Ptf.	Terciles				Quintiles			
		$f = 3$	6	9	12	$f = 3$	6	9	12
$h = 0$	L	-0.1489*** (-32.59)	-0.2223*** (-18.04)	-0.2866*** (-14.52)	-0.3414*** (-13.94)	-0.2103*** (-24.57)	-0.2452*** (-16.78)	-0.3937*** (-12.52)	-0.4652*** (-11.36)
	W	0.1458*** (47.04)	0.2124*** (22.94)	0.2707*** (18.24)	0.3299*** (18.78)	0.1991*** (46.04)	0.2343*** (19.58)	0.3571*** (18.16)	0.4337*** (20.37)
	W-L	0.2947*** (53.38)	0.4347*** (28.21)	0.5573*** (22.56)	0.6713*** (22.27)	0.4094*** (42.69)	0.4795*** (25.39)	0.7508*** (20.24)	0.8989*** (19.47)
$h = 3$	L	-0.0013 (-0.35)	-0.0132 (-1.30)	0.0046 (0.61)	0.0045 (0.42)	-0.0071 (-1.20)	-0.0227** (-2.30)	0.0248* (1.81)	0.0055 (0.39)
	W	-0.0003 (-0.07)	0.0121 (1.61)	0.0077 (1.02)	0.0220** (2.07)	-0.0010 (-0.23)	0.0062 (0.54)	0.0209 (1.59)	0.0279** (2.03)
	W-L	0.0010 (0.20)	0.0253 (2.27)	0.0031 (0.29)	0.0176 (1.18)	0.0061 (0.85)	0.0288* (1.91)	-0.0039 (-0.20)	0.0223 (1.13)
$h = 6$	L	-0.0100** (-2.14)	-0.0054 (-0.49)	-0.0131 (-1.21)	-0.0002 (-0.02)	-0.0232*** (-3.09)	-0.0196 (-1.63)	0.0122 (0.64)	-0.0052 (-0.25)
	W	0.0066 (1.24)	0.0121 (1.58)	0.0137 (1.08)	0.0230** (2.04)	0.0037 (0.65)	0.0103 (0.76)	0.0349* (1.80)	0.0248 (1.59)
	W-L	0.0166** (2.34)	0.0175 (1.48)	0.0268 (1.61)	0.0232 (1.33)	0.0269*** (2.86)	0.0299* (1.65)	0.0227 (0.84)	0.0299 (1.17)
$h = 9$	L	-0.0126** (-2.06)	-0.0210 (-1.29)	-0.0234* (-1.66)	0.0085 (0.42)	-0.0221** (-2.37)	-0.0336** (-2.00)	0.0067 (0.28)	0.0043 (0.15)
	W	0.0096 (1.63)	0.0141 (1.30)	0.0263* (1.81)	0.0059 (0.33)	0.0017 (0.24)	0.0092 (0.45)	0.0346 (1.60)	-0.0035 (-0.12)
	W-L	0.0222*** (2.62)	0.0352 (2.06)	0.0497** (2.46)	-0.0027 (-0.10)	0.0238** (2.01)	0.0428* (1.64)	0.0279 (0.87)	-0.0078 (-0.20)
$h = 12$	L	-0.0251*** (-3.46)	-0.0272 (-1.63)	-0.0218 (-1.48)	0.0071 (0.32)	-0.0467*** (-4.65)	-0.0408** (-2.24)	0.0162 (0.62)	0.0031 (0.11)
	W	0.0205*** (3.28)	0.0257** (2.00)	0.0261* (1.71)	0.0074 (0.37)	0.0153* (1.73)	0.0175 (0.79)	0.0338 (1.29)	-0.0131 (-0.45)
	W-L	0.0456*** (4.76)	0.0530*** (2.84)	0.0480** (2.26)	0.0003 (0.01)	0.0620*** (4.63)	0.0583** (2.03)	0.0175 (0.47)	-0.0161 (-0.39)

Notes. *f* and *h* are the formation period and the holding period, respectively. L is the loser or the *sell* portfolio, W is the winner or the *buy* portfolio, and W-L is the winner minus loser portfolio (*buy-sell* portfolio). The extreme portfolios are formed based on stocks' cumulative abnormal returns. *t*-statistics are reported in parentheses. ***, ** and * denote significance at 1%. 5% and 10% levels, respectively.

During the holding period (t = 3, 6, 9 and 12) and with the terciles method, the difference in *ACAR* for the various momentum strategies are positive, except for the (12/9) strategy, but only 8 strategies Out of 16 have average cumulative abnormal returns significantly different from zero (50% profitable strategies). For example, the (3/6) strategy picking stocks based on their CAR over the past 3 months and holding them for the next 6 months generates, on average, a cumulative abnormal returns of 1.66%   per month (t stat = 2.34) if the stocks are grouped into terciles and 2.69% (t stat = 2.86) if they are grouped into quintiles. With the

quintile method, the number of profitable momentum strategies is reduced to 7 out of 16 strategies.
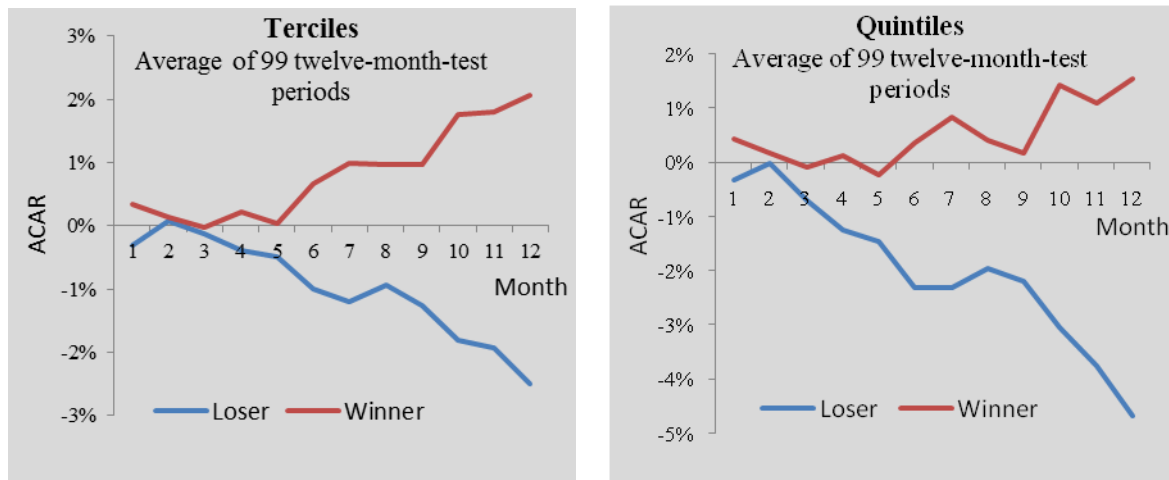

Figure 1. Evolution of the Average Cumulative Abnormal returns over a holding period of 12 months following to a 3 month-formation period (full sample period: 1991-2015)

The most profitable strategy is the (3/12) strategy i.e. the strategy that picks the quintile of stocks based on their past 3-month returns and holds them for the next 12 months. This strategy generates an $ACAR_{W-L}$ of 6.20% (t stat = 4.63).

The profitability of the momentum strategies comes from the continuation of the extreme portfolios' performances in the sense that the portfolio of the losing stocks remains loser and that of the winning ones remains winner in the subsequent months. These performances are illustrated in Figures 1 and 2 which plot the evolution of the average cumulative abnormal returns over a 12-month holding period for a formation period of 3 and 6 months, respectively. They show that the winner portfolio outperforms the loser one during the holding period. Next, we analyze the results from the Jegadeesh and Titman (1993) methodology.
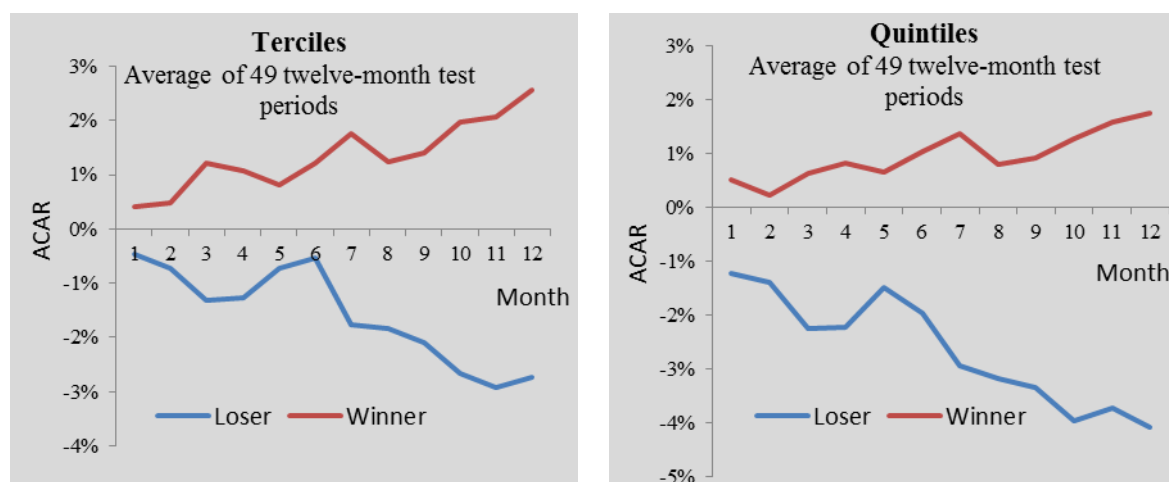

Figure 2. Evolution of the Average Cumulative Abnormal returns over a holding period of 12 months following a 6-month formation period (full sample period: 1991-2015)

Table 2. Returns of the winner, Loser and winner minus loser portfolios for different strategies: Full sample period January 1991-July 2015

		Terciles				Quintiles			
		f = 3	6	9	12	3	6	9	12
h = 0	L	-0.143*** (-25.84)	-0.212*** (-23.95)	-0.267*** (-22.84)	-0.308*** (-21.44)	-0.203*** (-26.77)	-0.300*** (-25.75)	-0.375*** (-25.02)	-0.432*** (-24.26)
	W	0.154*** (26.86)	0.232*** (28.22)	0.301*** (29.18)	0.365*** (29.42)	0.206*** (29.49)	0.305*** (31.90)	0.390*** (33.69)	0.466*** (34.97)
	W-L	0.297*** (52.71)	0.444*** (51.97)	0.568*** (51.53)	0.673*** (50.15)	0.409*** (56.10)	0.605*** (56.76)	0.765*** (57.13)	0.898*** (57.09)
t = 3	L	0.001 (0.23)	-0.001 (-0.14)	0.003 (0.56)	-0.001 (-0.29)	-0.005 (-1.02)	-0.003 (-0.58)	0.004 (0.74)	-0.003 (-0.60)
	W	0.005 (0.96)	(0.010** (2.02)	0.010* (1.88)	0.005 (0.86)	0.002 (0.36)	0.004 (0.71)	0.009 (1.45)	0.005 (0.79)
	W-L	0.003 (0.74)	0.010** (2.21)	0.007 (1.37)	0.006 (1.21)	0.007 (1.35)	0.007 (1.29)	0.005 (0.90)	0.008 (1.40)
h = 6	L	0.002 (0.23)	0.006 (0.79)	-0.001 (-0.10)	-0.002 (-0.36)	-0.010 (-1.38)	0.003 (0.45)	0.003 (0.40)	-0.004 (-0.48)
	W	0.015** (2.14)	0.021*** (2.85)	0.018** (2.26)	0.006 (0.64)	0.008 (1.16)	0.017** (2.09)	0.017* (1.81)	0.000 (-0.01)
	W-L	0.013* (1.90)	0.015* (1.93)	0.019** (2.50)	0.008 (1.03)	0.018*** (2.54)	0.014* (1.73)	0.014* (1.64)	0.003 (0.40)
h = 9	L	0.008 (0.78)	0.002 (0.23)	-0.001 (-0.14)	0.002 (0.21)	-0.001 (-0.14)	-0.005 (-0.53)	0.000 (0.04)	0.005 (0.57)
	W	0.027*** (2.98)	0.031*** (3.22)	0.022** (2.07)	0.001 (0.05)	0.020** (2.08)	0.024** (2.24)	0.014 (1.21)	-0.012 (-0.97)
	W-L	0.019** (2.04)	0.029*** (3.01)	0.023** (2.37)	-0.001 (-0.12)	0.021** (2.17)	0.029*** (2.91)	0.014 (1.29)	-0.017 (-1.57)
h = 12	L	0.004 (0.36)	0.004 (0.33)	0.003 (0.29)	0.012 (1.17)	-0.007 (-0.60)	-0.006 (-0.53)	0.005 (0.45)	0.020* (1.81)
	W	0.037*** (3.25)	0.035*** (2.85)	0.019 (1.48)	-0.006 (-0.41)	0.028** (2.28)	0.019 (1.44)	0.006 (0.42)	-0.022 (-1.49)
	W-L	0.033*** (2.91)	0.031*** (2.66)	0.016 (1.35)	-0.018 (-1.46)	0.034*** (2.94)	0.025** (2.08)	0.001 (0.07)	-0.042*** (-3.23)

Notes. *f* and *h* are the formation period and the holding period, respectively. L is the loser or the *sell* portfolio, W is the winner or the *buy* portfolio, and W-L is the winner minus loser portfolio (*buy-sell* portfolio). The extreme portfolios are formed based on stocks' returns. *t*-statistics are reported in parentheses. ***, ** and * denote significance at 1%. 5% and 10% levels, respectively

Table 2 displays the average returns of the Loser, Winner and Winner-Loser portfolios over the 1991-2015-full sample period. Among the 16 strategies, 9 momentum strategies are significantly profitable with the terciles method; however 7 strategies are profitable with the quintiles method. Similarly to the methodology of De Bondt and Thaler (1985), the most

profitable strategy is the (3/12) strategy. It generates an average return of 3.4% per month (t stat. = 2.94).

Table 3. Returns of the winner, Loser and winner minus loser portfolios for different strategies: Sub-period January 1991- Jun 2003

		Terciles				Quintiles			
		$f = 3$	6	9	12	3	6	9	12
$h = 0$	L	-0.1331*** (-16.47)	-0.1908*** (-14.27)	-0.2304*** (-12.72)	-0.2491*** (-10.83)	-0.1872*** (-18.66)	-0.2641*** (-17.21)	-0.3152*** (-15.79)	-0.3406*** (-13.94)
	W	0.1483*** (15.29)	0.2239*** (16.18)	0.2959*** (17.10)	0.3674*** (17.40)	0.1958*** (16.60)	0.2894*** (18.12)	0.3771*** (19.59)	0.4557*** (20.51)
	W-L	0.2815*** (31.52)	0.4147*** (30.48)	0.5263*** (29.71)	0.6165*** (27.93)	0.3830*** (34.98)	0.5535*** (35.34)	0.6923*** (35.30)	0.7963*** (34.10)
$h = 3$	L	0.0054 (0.71)	0.0027 (0.33)	0.0093 (1.08)	0.0020 (0.26)	-0.0003 (-0.05)	-0.0042 (-0.57)	0.0104 (1.20)	-0.0023 (-0.28)
	W	0.0057 (0.82)	0.0100 (1.37)	0.0074 (0.99)	-0.0007 (-0.08)	0.0049 (0.61)	0.0023 (0.28)	0.0103 (1.09)	0.0019 (0.21)
	W-L	0.0003 (0.04)	0.0073 (0.96)	-0.0019 (-0.23)	-0.0027 (-0.34)	0.0052 (0.68)	0.0064 (0.83)	-0.00004 (0.00)	0.0043 (0.48)
$h = 6$	L	0.0079 (0.64)	0.0195 (1.35)	0.0086 (0.68)	-0.0003 (-0.03)	-0.0034 (-0.29)	0.0054 (0.41)	0.0128 (1.02)	0.0036 (0.29)
	W	0.0159 (1.49)	0.0204* (1.69)	0.0127 (0.95)	-0.0064 (-0.44)	0.0087 (0.77)	0.0166 (1.27)	0.0170 (1.12)	-0.0130 (-0.83)
	W-L	0.0080 (0.69)	0.0009 (0.07)	0.0042 (0.32)	-0.0061 (-0.47)	0.0121 (1.05)	0.0113 (0.86)	0.0043 (0.31)	-0.0166 (-1.18)
$h = 9$	L	0.0255 (1.44)	0.0199 (1.15)	0.0124 (0.80)	0.0098 (0.66)	0.0166 (0.94)	0.0058 (0.37)	0.0200 (1.25)	0.0208 (1.27)
	W	0.0339 (2.22)	0.0363** (2.13)	0.0196 (1.05)	-0.0166 (-0.82)	0.0271* (1.70)	0.0335* (1.79)	0.0174 (0.84)	-0.0304 (-1.44)
	W-L	0.0085 (0.51)	0.0164 (0.95)	0.0072 (0.42)	-0.0264 (-1.48)	0.0105 (0.63)	0.0277 (1.61)	-0.0026 (-0.14)	-0.0511*** (-2.71)
$h=12$	L	0.0293 (1.45)	0.0274 (1.36)	0.0242 (1.28)	0.0320* (1.67)	0.0173 (0.86)	0.0158 (0.87)	0.0371* (1.87)	0.0488** (2.40)
	W	0.0518** (2.48)	0.0472** (2.10)	0.0193 (0.82)	-0.0239 (-0.93)	0.0454** (2.11)	0.0373 (1.54)	0.0071 (0.27)	-0.0386 (-1.42)
	W-L	0.0225 (1.10)	0.0198 (0.93)	-0.0050 (-0.23)	-0.0560** (-2.47)	0.0280 (1.35)	0.0216 (1.01)	-0.0300 (-1.31)	-0.0874*** (-3.64)

Notes: See notes of table 2.

However, we note that the (12/12) strategy generates a negative return significantly different from zero. This indicates a performance reversal consistent with the long-term overreaction hypothesis documented by De Bondt and Thaler (1985).

To check the robustness of our results, we divided our study period into two equal

sub-periods: the first sub-period is from January 1991 to June 2003 and the second one is from July 2003 to December 2015, covering 12.5 years each. We continue with the Jegadeesh and Titman (1993) methodology because it generates a high number of observations. But, applying the methodology of De Bondt and Thaler (1985) in this case will report biased results because of the low number of observations.

Results corresponding to the sub-period January 1991-June 2003 are shown in Table 3. For formation periods of 3, 6 and 9 months, the momentum strategies are not significantly profitable. However, for a formation period of 12 months, we detect a performance reversal of the extreme tercile portfolios after 12 months and the extreme quintile portfolios after 9 and 12 months.

However, for the sub-period July 2003-December 2015 (Table 4), the vast majority of momentum strategies are significantly profitable. With tercile portfolios, 14 strategies are significantly profitable however only 2 strategies are not although they generate positive returns. With quintile portfolios, 10 out of 16 strategies are significantly profitable. The most profitable strategy is always the (3/12) strategy with extreme quintiles. This strategy generates 4.81% per month (t stat = 3.98).

In sum, the momentum strategies are concentrated in the second sub-period. This implies that the profitable strategies detected over the full-sample period come from the presence of the momentum effect in the second sub-period. In fact, during this sub-period, the Tunis stock exchange became more dynamic than in the 1990s: a relatively high trading volume, the number of listed companies has increased, the Tunis stock exchange started to work on the promotion of financial culture to business executives, public servants, liberal professions, students, etc; investors are starting to pay more and more attention to the stock market; etc.

4. Conclusion

The momentum effect, documented by Jegadeesh and Titman (1993), means that stocks that generated high returns over a short period of time continue to generate high returns, while stocks with relatively low returns continue to perform poorly. A momentum strategy consisting in selling the losing stocks and buying the winning ones generates positive returns.

We examined this strategy in the Tunisian stock market for the period January 1991-December 2015 using the pioneering works of De Bondt and Thaler (1985) and Jegadeesh and Titman (1993). To measure the stock performance, the two methodologies use different criteria which are the Cumulative abnormal returns and the returns, respectively. 16 strategies were constructed by combining four formation periods and four holding periods of 3, 6, 9 and 12 months. These strategies sell the tercile (or quintile) of losing stocks and buy the tercile (or quintile) of winning stocks. We found evidence of momentum effect in the Tunisian stock market. Momentum profits are generally statistically and economically significant except for a 12- month formation period. Furthermore, the momentum strategies seem to be more profitable during the 2003-2015-sub-period when momentum profits can reach 4.81% per month.

Table 4. Returns of the winner, Loser and winner minus loser portfolios for different strategies: Sub-period July 2003- December 2015

		Terciles				Quintiles			
		$f = 3$	6	9	12	3	6	9	12
$h = 0$	L	-0.1530*** (-20.39)	-0.2332*** (-20.40)	-0.3016*** (-21.05)	-0.3640*** (-22.25)	-0.2197*** (-19.45)	-0.3360*** (-19.68)	-0.4321*** (-20.32)	-0.5187*** (-21.80)
	W	0.1589*** (26.37)	0.2399*** (26.75)	0.3061*** (26.53)	0.3633*** (26.58)	0.2162*** (29.25)	0.3198*** (30.51)	0.4024*** (30.71)	0.4749*** (31.27)
	W-L	0.3119*** (45.84)	0.4731*** (46.05)	0.6077*** (46.72)	0.7272*** (48.25)	0.4359*** (45.67)	0.6558*** (46.28)	0.8345*** (47.26)	0.9936*** (49.79)
$h = 3$	L	-0.0041 (-0.79)	-0.0039 (-0.82)	-0.0036 (-0.69)	-0.0048 (-0.91)	-0.0100 (-1.58)	-0.0012 (-0.20)	-0.0024 (-0.38)	-0.0040 (-0.69)
	W	0.0030 (0.45)	0.0093 (1.40)	0.0108 (1.53)	0.0087 (1.17)	-0.0012 (-0.17)	0.0053 (0.69)	0.0068 (0.81)	0.0068 (0.73)
	W-L	0.0071 (1.19)	0.0132** (2.29)	0.0144** (2.32)	0.0134** (2.10)	0.0088 (1.33)	0.0065 (0.95)	0.0092 (1.24)	0.0107 (1.39)
$h = 6$	L	-0.0055 (-0.80)	-0.0062 (-0.82)	-0.0104 (-1.39)	-0.0057 (-0.73)	-0.0165* (-1.97)	0.0020 (0.23)	-0.0083 (-0.93)	-0.0127 (-1.46)
	W	0.0155** (1.68)	0.0240*** (2.63)	0.0257*** (2.57)	0.0171* (1.65)	0.0092 (0.98)	0.0197* (1.90)	0.0179 (1.56)	0.0119 (0.95)
	W-L	0.0210*** (2.58)	0.0302*** (3.60)	0.0361*** (4.09)	0.0228** (2.49)	0.0256*** (2.88)	0.0177* (1.86)	0.0262*** (2.56)	0.0247** (2.29)
$h = 9$	L	-0.0066 (-0.68)	-0.0127 (-1.26)	-0.0122 (-1.22)	-0.0037 (-0.38)	-0.0169 (-1.59)	-0.0123 (-1.22)	-0.0169 (-1.45)	-0.0078 (-0.77)
	W	0.0273*** (2.61)	0.0352*** (3.32)	0.0312*** (2.63)	0.0208* (1.69)	0.0200* (1.76)	0.0236** (1.99)	0.0178 (1.35)	0.0099 (0.69)
	W-L	0.0340*** (3.35)	0.0479*** (4.63)	0.0434*** (3.96)	0.0245** (2.22)	0.0369*** (3.35)	0.0359*** (3.26)	0.0347*** (2.79)	0.0177 (1.43)
$h = 12$	L	-0.0102 (-0.89)	-0.0096 (-0.82)	-0.0078 (-0.71)	0.0034 (0.33)	-0.0225* (-1.97)	-0.0162 (-1.44)	-0.0154 (-1.24)	0.0038 (0.34)
	W	0.0370*** (3.24)	0.0363*** (2.92)	0.0301** (2.29)	0.0201 (1.50)	0.0256** (2.01)	0.0142 (1.07)	0.0159 (1.05)	0.0013 (0.09)
	W-L	0.0472*** (4.12)	0.0459*** (3.81)	0.0379*** (3.13)	0.0166 (1.38)	0.0481*** (3.98)	0.0304** (2.47)	0.0313** (2.27)	-0.0025 (-0.18)

Notes. See notes of table 2.

However, momentum strategies remain not exploitable in the Tunisian context since they are based on the short sale of winning stocks which is forbidden in Tunisia. Given the robustness of this anomaly in the Tunisian context which is sustained by a statistical and economic

significance of momentum profits, we recommend that the financial market council, the authority of the Tunisian stock market, revise its stock market policy in order to attract investors interested in such strategy and to make the Tunisian stock market, known as a "conservative market", more dynamic.

The question now is what explains the momentum effect in the Tunisian stock market? Two controversial explanations would be explored in our future research: the rational explanation and the behavioral explanation. The rational explanation attributes this anomaly to the risk. The winning stocks outperform the losing ones because they are riskier. The recent five-factor model of Fama and French (2015), an augmented version of Fama and French (1996), or the four-factor model of Carhart (1997) could be used to examine whether a multidimensional risk explains this anomaly. The behavioral explanation is based on the investor psychology. The momentum effect can be explained by the disposition effect (Grinblatt and Han, 2005), the representativeness heuristic (Barberis, Shleifer and Vishny, 1998) or the investor overconfidence (Daniel, Hirshleifer and Subrahmanyam, 1998).

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Appendix

The Firms composing our sample for the period July 2003 to December 2015 are: ADWYA, AETECH, AIR LIQUIDE (STOA), ALKIMIA, AMEN BANK, AMEN LEASE, AMS, ARTES, ASS MULTI ITTIHAD, ASSAD, ASTREE, ATB, ATL, ATTIJARI BANK (Ex. BS), ATTIJARI LEASING (GENERAL LEASING), BATAM, BDET, BEST LEASE, BH, BIAT, BNA, BNDT, BT, BTE, CARTE, CARTHAGE CEMENT, CARTHAGO, CELLCOM, CEREALIS, CIL, CIMENTS DE BIZERTE, CITY CARS, DELICE HOLDING, EL

MAZRAA, EL WIFACK LEASING, ELBENE (TUNISIE LAIT), ELECTROSTAR, ENNAKL AUTOMOBILES, ESSOUKNA, EURO-CYCLES, GIF, HANNIBAL LEASE, HEXABYTE, ICF, LAND OR, le MOTEUR, MAGASIN GENERAL, MAGHREB INTERN PUB, MODERN LEASING, MONOPRIX, MPBS, NEW BODY LINE, OFFICEPLAST, ONE TECH HOLDING, PBH, PBH (ADP), PLACEMENT DE TUNISIE, POULINA GP HOLDING, SAH, SALIM, SERVICOM, SFBT, SIAME, SIMPAR, SIPHAT, SITS, SOMOCER, SOPAT, SOTEMAIL, SOTETEL, SOTIPAPIER, SOTRAPIL, SOTUMAG, SOTUVER, SPCD, SPDIT SICAF, STAR, STB, STEQ, STIL, STIP, STS (STE TUN. DU SUCRE), TAWASOL GP HOLDING, TELNET HOLDING, TPR, TUNINVEST SICAR, TUNIS RE, TUNISAIR, TUNISIE LEASING, UADH, UBCI and UIB.

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