Predicting Contemporary Volume with Historic Volume at Differential Price Level: Prospect Theory vs Regret Aversion

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ABSTRACT

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This paper studies the behaviour of investors in the Amman Stock Exchange (ASE) through emphasising two behavioural theories: prospect theory and regret aversion theory. Prospect theory predicts disposition to sell winner stocks and ride loser stocks. Regret aversion, on the other hand, explains why investors may have difficulty in realising gains as well as losses. A new methodology is used to examine the relationship between volume at a given point in time and volume that took place in the past at different stock price level. The results support the prospect theory that investors show an inclination to sell shares for which price increased and keep shares for which price decreased.

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I. INTRODUCTION

This paper studies the investor's behaviour and decision to realize gains and losses. Specifically, the paper focuses its attention on Amman Stock Exchange (ASE) and seek to determine whether investors in this market exhibit an unwillingness to realize losses (i.e. disposition to ride losses). Knowing the investor's behaviour will, consequently, help in making profitable trading strategies (1).

The empirical work in this paper is based mainly on the theoretical framework of the behavioural model described in an earlier work on dividends by Shefrin and Statman (1983). The model described here has two major elements: Prospect theory and regret aversion. Each of these elements contribute something distinctive to the analysis of the ASE. Prospect theory predicts a disposition to sell winners and ride losers when the proceeds realized are held, as opposed to being rolled over into another investment. Aversion to regret, on the other hand, provides an important reason why investors may have difficulty realising gains as well as losses.

To test the above mentioned elements of the conceptual framework in the context of the ASE, this paper will introduce a variation of a new methodology discussed by Ferris, Haugen and Makhija (1987). The methodology examines the relationship between volume at a given point in time and volume that took place in the past at different stock price levels. A change in price between the two dates may not induce abnormal volume if relatively few shares traded at these prices. The contribution of this paper is to use a new methodology to empirically study the behaviour of the investors trading in the ASE by taking volume levels at previous price levels into account in predicting the level of abnormal volume at a given point in time.

The sample used in this study consists of the daily closing prices of securities of 16 publicly owned firms collected from the ASE during the period from January 1, 1985 to December 31, 1989.

The next section reviews the positive theory of selling winners and riding losers. Section III presents the main properties of the ASE Data and methodology will be presented in section IV. Section V discusses the results, and the final section concludes the paper.

II. A POSITIVE THEORY OF SELLING WINNERS AND RIDING LOSERS.

The section reviews the general properties of the prospect theory and regret aversion

A. Prospect Theory

The prospect theory, as a descriptive theory of choice under uncertainty, first started by an article proposed by Kahneman and Tversky (1979). Prospect theory suggests the hypothesis that investors show an inclination to sell winners (i.e. shares for which prices increased) and ride losers (i.e. shares for which prices decreased). This inclination emerges from a combination of several features. First, decision makers develop the choices in a particular way. Kahneman and Tversky (1979) refer to this as the "editing stage." Significantly, the editing stage develops all choices in terms of possible gains and/or losses relative to a fixed reference point. In the second stage which is the evaluation stage, decision makers employ an S-shaped valuation function (i.e. a utility function on the domain of gains and/or losses) which is concave, and reflects risk aversion, in the gain region and convex, which reflects risk seeking, in the domain of losses (2).

To elaborate on the disposition to sell winners and ride losers, suppose that an investor purchased a stock in the beginning of the month for JD25. At the end of the month, this investor found that the stock price reduced to JD20. The investor must decide whether to realize loss or hold the stock for one more period. Assuming perfect market, (i.e. there are no taxes or transaction costs). Suppose also that during the coming period, one of two equiprobable outcomes will emerge: either the stock price will increase by JD5 or decrease by JD5. According to the prospect theory, the investor frames his choice as a choice between the two lotteries:

1 - If the investor sells the stock, he will realize JD5 "paper loss."

2 - If the investor on the other hand, hold the stock for one more period, there will be a 50 - 50 chance of losing an additional JD5 or "breaking even."

Since the choice between these two lotteries is associated with the convex portion of the S-shaped value function, prospect theory implies that choice 2 will be selected over choice 1. (3).

A positive correlation between price and volume is, therefore, suggested by prospect theory. One of the most significant and unique features of Kahneman and Tversky's approach to choice under uncertainty is aversion to loss realisation (Shefrin and Statman p 788).

Therefore the first hypothesis to be tested and based on the prospect theory is as follows:

H_1: The volume of trading in stocks with capital gains will exceed the volume of stocks with capital losses in all months of the year.

B. Seeking Pride and Avoiding Regret

Regret is an emotional feeling associated with the expost knowledge that a different past decision would have been better that the one chosen. The positive counterpart to regret is pride. While closing a stock account at a loss induces regret, closing it at a gain induces pride. Gross (1982) suggests that investors may oppose the realisation of a loss because it stands as a proof of the investor's wrong Judgement. In addition the regret at having made a mistake may be worsen by having to admit the mistake to others as family or friends. This feature has been discussed by Thaler (1984) and Kahneman and Tversky (1979)

Kahneman and Tversky (1979) and Thaler (1984) argue that an asymmetry between the strength of pride and regret (regret is stronger) leads inaction to be favoured over action. Consequently investors who are faced by this bias may be unwilling to realize both gains and losses. For example, suppose an investor sells certain stock at a gain, and continue to monitor its progress. If the price of the stock continues to rise, the investor's feeling of pride will be reduced by the regret at having sold too quickly.

Therefore, aversion to regret can easily explain the behaviour of investors that having a difficulty in realising gains as well as losses.Consequently, based on the regret aversion the paper hypothesises the following:

H_2: Volume of stocks traded does not change significantly with both capital gain or capital loss in all months of the year.

III. CHARACTERISTICS OF THE AMMAN STOCK EXCHANGE (ASE)

The ASE started its operation on January 1, 1978 with stocks of 57 listed firms. The number of listed firms has reached 124 during the period 1979 - 1989. The listed firms in the ASE are officially grouped into four sectors: Industrial sector (47 companies), Services sector (32 companies), Insurance sector (20 companies), and Banking and Finance sector (25 companies). In addition, the number and the volume of traded shares have increased significantly.

The following characteristics and barriers to the development of the ASE should be noted:

1 - The ASE is a thin and small market in terms of both, the volume of shares traded and the number of securities listed. High issue costs, institutional gaps and complicated listing procedures should be added as obstacles to the development of the ASE.

2 - For any listed stock, price variations are not allowed to exceed, in neither direction 10% of its opening price (4).

3 - The daily trading session of the ASE, on average, lasts two hours.Stock price quotations are transmitted live from the trading floor via Reutor Monitor Network worldwide (5).

4 - Another main barrier to the development of the ASE in the political and the economic instability. Such reduces investor planning horizons, increase the capital flight and makes investments in gold and physical assets more desirable than investments in financial instruments. In addition, religious and social practices, high expenditures on marriage ceremonies and religious rules against the payments of interests on loans and deposits work to the detriment of saving investment process.

5 - Other factors could be related directly to the behaviour of investors in the ASE. The investors in the ASE could be divided into two types: Institutional investors, as government agencies and other financial institutional, whose main goal is to boost the economic development, and Individual investors who are profit maximisers.The Jordanian investors, in general, are unsophisticated and usually lack experience and /or time in analysing and managing their investments in the stock market. Because of such characteristics, the investors in the ASE are considered to be speculative. This speculative behaviour arises mainly from high uncertainty as rumours and insider information.

IV. DATA AND METHODOLOGY

The following data and methodology are designed to test for the prediction of the disposition hypothesis and regret aversion using trading volume and price performance:

1 - The data consist of daily closing prices of securities of 16 firms collected from Amman Stock Exchange. Firms are selected from the original sample of 64 industrial firms on the exchange. Several had to be dropped due to problems of data unavailability and lack of continuous trading. The time period under study is from January, 1985 to December 1989. The final data base consists of daily end stock prices, with the number of observations per firm are provided in table (1).

2 - We calculate the rate of change by taking the logarithmic difference between the close stock pride of two successive trading days. Daily abnormal trading volume are estimated using a market model regression for volume for each stock i as follows:

$$V_{it} = a_i + b_i V_{im} + e_{it} \qquad (1)$$

Where

V_{it} = turnover for stock i on day t

$$= \frac{\text{number of shares of stock i traded on day t}}{\text{Total number of shares of stock i outstanding on day t}}$$

$$= \frac{\text{number of shares of all stocks traded on day i}}{\text{Total number of shares of all stocks outstanding on day t}}$$

e_{it} = abnormal turnover for stock i on day t

Table (1)
Basic Information

Firm No	Firm Name	No of Daily Transactions	Daily Frequencies	No of Monthly Transactions	Monthly Frequencies
1.	Arab Aluminium Industries	1172	0.966	60	1.00
2.	Petro Refinery Comp.	1169	0.963	59	0.98
3.	Intermediate Petro-Chemical Ind.	1134	0.934	60	1.00
4.	The Arab Pharmaceutical Comp.	1073	0.884	60	1.00
5.	Jordan Dairy Comp.	1040	0.857	60	1.00
6.	Dar Al-Dawa Development and Inv	920	0.758	60	1.00
7.	Jordan Limes Silicate Brick Ind.	907	0.747	58	0.97
8.	National Steel Industry	906	0.746	48	0.80
9.	Jordan Industries Match Comp.	872	0.718	60	1.00
10	Jordan Pipes Manufacturing	871	0.718	58	0.97
11.	Aladdin Industries	841	0.693	48	0.80
12.	Jordan Ceramic Industrial	787	0.648	59	0.98
13.	Jordan Phosphate Mines	760	0.626	56	0.93
14.	Jordan Chemical Ind.	720	0.593	58	0.97
15.	Jordan Glass Industry	582	0.479	49	0.82
16.	National Industries	528	0.435	42	0.70
	Total	14282	11.765	895	14.92
	Average	892.63	0.74	55.94	0.93

Equation (1) allows us to estimate e_{it} (i.e. the fraction of outstanding stocks of firms i traded on day t) after removing the effects of market wide events. Abnormal turnovers for each stock are estimated by fitting equation (1) for each stock for the period from January 1, 1985 to December 31, 1989. The volume traded is taken from the daily stock price Record for the ASE collected manually, and the number of outstanding shares is obtained from the Jordanian shareholding Guide parts 5 and 6. The market turnover is calculated using the total shares traded on the ASE, collected manually from the Daily stock Record for the ASE.

3 - The relation of the abnormal turnover (e_{it}) for any stock at its given price (p_{it}) to its turnover is formulated as follows:

(a) - Eight price ranges around (p_{it}) are considered to classify past price for the stock (p_{in}) where n is a trading day in the past. These ranges are:

Range 1: $p_{it} < p_{in} \leq (1 + x)\, p_{it}$

Range 2: $(1 + x)\, p_{it} < p_{in} \leq (1 + 2x)\, p_{it}$

Range 3: $(1 + 2x)\, p_{it} < p_{in} \leq (1 + 3x)\, p_{it}$

Range 4: $(1 + 3x)\, p_{it} < p_{in}$

Range 5: $p_{it} \geq p_{in} > (1 - x)\, p_{it}$

Range 6: $(1 - x)\, p_{it} \geq p_{in} > (1 - 2x)\, p_{it}$

Range 7: $(1 - 2x)\, p_{it} \geq p_{in} > (1 - 3x)\, p_{it}$

Range 8: $(1 - 3x)\, p_{it} \geq p_{in}$

where: x = 0.05, 0.075 and .100

The stock price on a past trading day (day n) is classified in one of the ranges 1 through 4 if the price on that day was greater than on day t. Also, prices lower than on day t would fall in one of the ranges 5 through 8.

(b) - To analyse the abnormal turnover for day t, the eight ranges corresponding to the closing stock price for day t, the eight ranges corresponding to the closing stock price for day t are defined. Each past trading day, going back for one calendar year (365 days) is classified as to range and the raw volume of trading for that day is assigned to that range. Finally all the volume of trading for that day is assigned to that range.

Finally, all the volume assigned to a range is added. The end product is eight cumulative volume numbers, each representing the total of all the abnormal turnover that occurred for a range (6)

(c) - The following regression is formulated

$$e_{it} = \alpha_0 + \beta_1 E_{1it} + \beta_2 E_{1it} + \beta_3 E_{1i\tau} + \beta_4 E_{1it}$$

$$+ \beta_5 E_{1i\tau} + \beta_6 E_{1i\tau} + \beta_7 E_{1i\tau} + \beta_8 E_{1i\tau} + u_{1i\tau}$$

where E_{1it} is the cumulative raw volume experienced by stock i for all the days over the last calendar year when its price is in range 1. The other variables are defined similarly.

4 - According to hypothesis (1) (i.e. the disposition effect), the paper predicts that during all months of the year.

H1: $\beta_k < 0$ for k = 1, ...,4
$\beta_k > 0$ for k = 5, ...,8

While the second hypothesis predicts that during all months of the year.

H2: $\beta_k < 0$ for k = 1, ...,8

V. EMPIRICAL RESULTS

A. Descriptive Statistics

Table (2) presents the means, standard deviations, kurtosis and skewness for daily stock price change series for 16 individual industrial firms. The results of the table indicates that 15 out of 16 firms have positive means. However, all the means, as a whole, indicate that the daily price changes are highly peaked in the central portions of their distributions. The skewness values, on the other hand, suggest slight deviations of the distributions from the complete bell shaped symmetry.

B. Market Average Turnover

Most analysis in this paper is concerned with abnormal turnover. In this section I will comment briefly on the time series and seasonal characteristics of the market wide average

turnover rate. The market turnover rates here are simple averages of the company turnover rates and go back to 1985. Table (3), panel A, provides yearly turnover rates for the ASE, which ranges from 18.9% to 21.0% during the study period, and appear to be increasing over time.

Table (2)
Descriptive Statistics

Firm No	M	SD	K	S
1.	.0010	.049	117.42	0.529
2.	.0001	.136	445.43	-0.013
3.	.0010	.131	198.24	0.361
4.	.0001	.034	54.68	1.124
5.	.0010	.027	230.08	-0.085
6.	.0010	.112	381.28	0.061
7.	-.0010	.039	2.11	0.234
8.	.0010	.027	48.97	-0.727
9.	.0010	.029	16.68	0.247
10.	.0010	.031	113.23	0.283
11.	.0020	.161	195.98	0.260
12.	.0010	.663	104.81	0.249
13.	.0010	.038	58.95	-0.271
14.	.0020	.129	184.48	-0.057
15.	.0020	.147	222.30	1.582
16	.0010	.164	153.03	0.156

Note: M = Mean, SD = Standard Deviation, K = Kurtosis, S = Skewness

Monthly data on average turnovers are presented in panel B of Table (3) for the ASE. On the ASE, the turnover rate in December is higher than in any other month. part of the seasonal variation in turnovers may be due to seasonal differences in the number of trading days per month. Table (3) panel C, presents the average n umber of trading days each

month. There seems to be a positive correlation between average monthly turnover (panel B) and the average number of trading days per month (panel C).

C. Cross-Sectional Results

Cross-sectional regression results using equation (2), one for each month, starting with the first month in January are presented in table 4. The analysis in this table used a 7.5% grid. Table 4 presents the mean coefficients and their T statistics. Generally, the results support the disposition effect. There seems a substantial stability in the relationship from month to month. The coeffices, β_1 through β_4 are predominantly significant and negative while the coefficients β_8 are largely significant and positive. Therefore the papers' results support the disposition effect in favour to the regret aversion hypothesis (7).

VI. CONCLUSIONS

In this study, the researcher attempted to measure the extent of both the prospect theory and the regret aversion trading strategies. In general, the empirical design in this paper enables the researcher to distinguish between the prospect theory and the regret aversion.

This paper finds clear evidence that investors show an inclination to sell shares for which price increased and keep shares for which prices decreased.The relationship the research finds are highly significant and robust to the grid size (i.e. whether it is 0.05, 0.075, or 0.10). In addition, the relationship between contemporary volume and historic volume at higher and lower price levels seemed to be stable over the months of the year. Further work with larger sample size is also important.

Table (3)
Average Monthly Turnover Per Company for the ASE by Years and Months, 1985 -1989
(percent per month)

Panel A: Average Monthly Turnover per Company by Year

Year	1985	1986	1987	1988	1989	Average
ASE	18.9	20.5	20.9	21.5	21.9	20.74

Panel B: Average Monthly Turnover per Company by Month

Month	Jan.	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
	7.6	8.6	8.8	8.9	7.8	7.9	8.1	7.6	8.4	8.9	8.3	9.2	8.34

Panel C: Average Number of Trading Days per Month

Month	Jan.	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
Reading Days	14.5	16.3	16.7	16.7	14.7	14.6	15	14.3	15.8	16.9	15.6	17.7	15.7

Table (4)
Mean Monthly Values for the Coeffecients and "t" Statistics

		Volume at High Prices					Volume at Low Prices			
Month	**Adjusted R^2**	**α**	**ß1**	**ß2**	**ß3**	**ß4**	**ß5**	**ß6**	**ß7**	**ß8**
January	.2145	.00012 (-2.67)*	.-.00236 (-2.05)*	-.00226 (-2.11)*	-.00213 (-2.21)*	-.00293 (-2.36)*	.0012 (1.63)	.00271 (2.009)*	.00185 (1.88)	.00270 (2.001)*
February	.2181	.000075 (0.912)*	-.00234 (-0.06)	-.00243 (-2.25)*	-.00286 (-2.676)*	-.00331 (-2.65)*	.00389 (3.123)*	.00274 (2.011)*	.003203 (3.21)*	.00273 (2.012)*
March	.1996	.000075 (0.912)	-.00156 (1.83)	-.00234 (-2.09)*	-.00265 (2.329)*	-.0035 (-2.652)*	.00369 (3.100)*	.00240 (1.98)*	.00423 (3.92)*	.00169 (1.59)
April	.2163	.000034 (0.5)	-.00273 (1.83)	-.00234 (-2.09)*	.-00169 (-2.676)*	-.00323 (-2.81)*	.00409 (3.12)*	.00151 (1.79)*	.00452 (3.99)*	.001693 (1.61)
May	.2160	.000097 (0.993)	-.00156 (-2.61)*	-.00236 (-2.10)*	.-00417 (-3.63)*	-.00381 (-2.54)*	.00336 (2.69)*	.00367 (2.29)*	.00197 (-1.78)*	.00209 (2.99)*
June	.2092	.000089 (0.892)	-.00285 (-2.63)*	-.002342 (-2.06)*	.-00421 (-3.69)*	-.00538 (-3.921)*	.00376 (3.015)*	.00302 (2.243)*	.00425 (3.67)*	.002089 (1.99)*
July	.2156	.000099 (0.998)	-.00298 (-2.72)*	-.00156 (1.63)	-.00292 (-2.95)*	-.00269 (-2.29)*	.00368 (3.009)*	.00356 (2.278)*	.004226 (3.29)*	.002091 (2.11)*
August	.2146	-.00028 (-2.862)*	-.00199 (-2.12)*	-.00237 (-2.16)*	-.00341 (-2.89)*	-.00332 (-2.62)*	.003682 (3.010)*	.00253 (2.273)*	.003948 (2.983)*	.002630 (2.53)*
September	.2144	-.0036 (-2.863)	-.00312* -(-2.29)	-.002289 (-1.99)*	-.00343 (-2.86)*	-.00352 (-2.73)*	.00309 (2.09)*	.002531 (2.2723)*	.004016 (3.211)*	.002619 (2.51)*
October	.2173	-.0000985 (-1.013)	-.00382 (-2.36)*	-.00230 (-2.16)*	-.00299 (-1.99)*	-.00281 (-1.98)*	.003253 (2.16)*	.002529 (2.269)*	.004029 (3.225)*	.002682 (2.82)*
November	.2126	.000196 (1.855)	-.00461 (-3.09)*	-.001295 (.996)	-.00362 (-2.82)*	-.00312 (-2.26)*	.003601 (2.39)*	.00326 (2.953)*	.004423 (3.518)*	.002688 (2.856)*
December	.2155	.000258* (2.009)*	-.00454 (-2.95)*	-.002276 (1.95)	-.00351 (-2.79)*	-.0040 (-3.09)*	.00278 (-2.19)*	.00318 (2.862)*	.00353 (2.75)*	.002701 (2.91)*

t. statistics are in parentheses
* Significant at 5% level

Footnotes

1 - The ASE in official publications is referred to as the Regular Market.

2 - For more details about the prospect theory and origin, the author refers the readers to the paper by D. Kahneman and A. Tversky. "Prospect Theory: An Analysis of Decision Under Risk." Econometrica 47, March 1979, p 263 - 91.

3 - Given that the investor prefer 2 over 1 is strict, investors would be willing to accept 2 if the odds were less than 50 - 50. If the odds are very low, however, investor would prefer to realize loss.

4 - After 1989, this margin was reduced to 5 percent and during the Gulf War the margin reduced further to 2 percent.

5 - Amman Financial Market (1989, p 24 and 27).

6 - The volume traded at any past price will not necessarily be held up to and then traded on the particular day t which is being analysed. Buyers at past price levels may trade before or after day t. This makes the cumulative volumes noisy. In any case, volume at all the price levels are affected in a similar manner, so this problem is not likely to import a bias to our regression results.

7- The grid used for the analysis is 7.5%. The same analysis using 5% and 10% grid size is also conducted. Since the results are relatively insensitive to the size of the price grid, therefore the paper only publishes the results using 7.5% grid.

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