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MOMENTUM AND DISPOSITION EFFECT IN THE STOCK MARKET OF USA

Abstract:

This paper analyze whether momentum effect drives disposition effect and vice versa during the period of January 1963 to 2017 in the stock market of USA. To examine the relationship, Fama and Macbeth (1973) cross sectional regressions are performed in the study. The results show that disposition effect drives momentum but not the other way around. Furthermore, this relationship is also examined for three sub-samples, and we find that relationship between momentum and disposition effect varies over the time and one possible reason could be crisis as sample is divided on the basis of the dot-com bubble and global financial crisis. Another finding of the study is that along with the disposition effect, size also has an impact on the momentum effect. To further analyze the impact of size on momentum and disposition effect, we test the relationship between momentum and disposition effect on the basis of size deciles. The results demonstrate that relationship does not vary significantly over the size of stocks but it does have an impact on momentum and disposition effect as past cumulative returns, and capital gain varies monotonically with the increase in the size of stocks.

Keywords:

Momentum, Disposition effect, Fama-Macbeth regression, Behavioral Finance, Size effect

JEL Classification: M20, D89, C01

1. Introduction

Momentum is one of the well-documented and persistence anomalies (Rouwenhorst, 1998; Conrad and Kaul, 1998; Lo and MacKinlay, 1998; Griffin et al., 2003; Hurn & Pavlov,2003; Rey and Schmid, 2007; Cheng and Wu, 2010; Ansari and Khan, 2012; Cakici et al., 2013; Barroso and Santa-Clara, 2015; Andrei and Cujean,2017). Jegadeesh and Titman (1993) were the first to identify momentum in stock return which refers to the stocks that performed well (poor) in the past will continue to perform similarly in future periods. This shows that current stock returns affected by their own past returns that are unrelated to risk (systematic or non-systematic). An investor who believes in momentum effect will take a long position (short position) in past winner stocks (loser stocks).

Disposition effect, defined as the tendency of investor to sell the stocks whose price goes up (winning stocks) and hold the stocks whose price goes down (losing stocks), is another anomaly in behavioral finance. Researchers examined the presence of disposition effect among different types of investors and markets (Odean, 1998; Shapira and Venezia ,2001; Feng and Seasholes, 2005; Dhar and Zhu,2006; Shefrin,2007; Jin and Scherbina,2010; Ben-David and Hirshleifer,2012; Richards et.al, 2015; Chang et.al, 2016). It was first identified by Shefrin and Statman (1985), they suggest that investors tend to hold onto losing stocks as compared to winning stocks. Their study based on the characteristics proposed by Kahneman and Tversky's (1979) in critique of expected utility theory. Kahneman and Tversky's prospect theory (1979) proposed that investors consider changes in wealth. Investors perceive the outcome as loss or gain on the basis of reference point (it is basis for evaluation where investors compare the gain and loss by comparing the paid/invested amount) where investors' have risk seeking behavior for losses and risk averse for gain. Therefore, the investors sell winning stocks and hold the losing stock and that risk averse behavior for gain and risk seeking behavior for losses cause disposition effect.

Our main contribution is to show whether momentum drives disposition effect or not and also the effect of size on relationship between momentum and disposition effect. Investor may believe that after a particular time period, stock price will converge to its fundamental value and the prices of overvalued (undervalued) stocks will go down (up). Therefore, they eagerly sell the winning stocks and hold the losing stocks as momentum exist for short or intermediate horizon. Unlike previous studies, this study analyzes that whether momentum drives disposition effect in the stock market of USA or not.

Literature suggests that disposition effect drives momentum as the investors analyze the past return so it can also be possible that due to momentum (a particular trend in returns), investor decides to hold or sell the security and it may cause disposition effect. Like previous studies we also test that whether disposition effect drives momentum or not because this study uses different sample period which also includes the period of the Global Financial Crisis (GFC) and the dot-com bubble. Lin (2011) examine the disposition effect in Taiwan and Chinese stock market during 1997 Asian financial crisis and 2008 global financial crisis along with the effect in appreciation and depreciation periods. They find that disposition effect exists in both markets during 1997 Asian financial crisis while it only exists in Chinese stock market during 2008 global financial crisis. Therefore, for the robustness, subsample analysis is performed by incorporating two major crisis (dot-com bubble and global financial crisis) to test whether the crisis brings change in the relationship between disposition effect and momentum or not.

Previous studies analyze the impact of size and momentum (e.g. Liu et al., 1999; Marshall and Cahan, 2005; Fama and French, 2012) and, size and disposition effect (e.g. Ranguelova, 2001; Frazzini, 2006) and find that there is a relationship between size and momentum and, size and disposition effect (some references here). Therefore, in this study we test that whether size also has an impact on the relationship between momentum and disposition effect by examining the trends in cumulative returns and capital gain in relation to the size of stocks.

Disposition and momentum effect are two anomalies of behavioral finance where earlier one explains about the investors' decision regarding buying and selling of securities whereas later determines the time series pattern in stock return. The disposition investors affect the rational demand function because of selling winner stocks and keeping loser ones. It also has an effect on equilibrium price and cause under-reaction to news. If there is good news about stock, it creates capital gain for disposition investors and the excess selling leads to under reaction to good news (stocks become overvalued). Whereas, if there is bad news in market, this cause capital losses for disposition investors (stocks become undervalued at equilibrium). As the resulted under-reaction gets corrected, momentum in stock returns will emerge and investors can benefit from pursuing relative strength strategies.

The disposition effect sometimes linked to loss aversion but Grinblatt and Han (2002) suggest that for loss aversion two conditions are necessary to meet: "i) the decline in utility for a loss must be greater than increase in utility for gain of equal amount; ii) a gamble that is always a loss relative to the reference point generates higher utility than a certain loss with same meanwhile the reverse preference applies to gambles that are always gains." Another reason to hold loser stocks and sell winning stocks could be the investors are risk seeker for losses and they consider mean reversion of returns (today's losers will outperform today's winners in future). Andreassen (1988) did experimental study and finds that the subjects buy and sell stocks as they believe in mean reversion. Whereas, Shefrin and Statman (1985) propose that although investors are reluctant to sell losing stocks but they do so in December to realize tax benefit as end of fiscal year is the time to realize the losses and Odean (1988) also finds that tax motivated selling prevails in the month of December. Kadous et al. (2014) focus on the loss side of disposition effect and propose psychological explanation for holding losing stocks. They find that if investor believe in mean reversion, they do not drive disposition effect and their experiment shows that investor hold losing stocks too long to maintain the positive self-image.

Weber and Zuchel (2001) find that disposition effect can explain momentum in stocks and their model also explains the seasonality effect in momentum profits. Grinblatt and Han (2005) also examined that disposition effect drives momentum in stock returns of USA. They argue that because of disposition effect, there is spread between fundamental value of stock and equilibrium price that shows the under-reaction of prices. By using sample of 13,460 Chinese investors and firms from a large Shanghai brokerage firm, Shumway and Wu (2006) find that disposition effect exists in majority of Chinese investor and their results also suggest that disposition effect drives momentum in stocks.

As researchers (Shumway and Wu, 2006; Goetzmann and Massa, 2008; and Frazzini, 2006) recognized that disposition effect can delay the incorporation of news and can induce the predictability of returns. It is also examined that disposition effect can generate price momentum in the stocks whose prices vary due to stock split but it is not the only factor which drives momentum (Birru, 2015). Hur, Pritamani and Sharma (2010) find evidence in the sample of NYSE/AMEX/NASDAQ stocks that disposition effect drive momentum more in the stocks where there is more presence of individual investors. And also find that effect of disposition effect induced momentum is greater in hard to value stocks. Kong, Bai and Wang (2015) analyze the impact of disposition effect on momentum in Chinese market by using the model of Grinblatt and Han (2005) find that disposition effect does not drive momentum in Chinese stock market. This shows that momentum in Chinese market can because of some factors other than disposition effect. To find this relationship, we have developed research hypothesis:

H1: There is positive relationship between past returns and unrealized capital gain variable.
H2. Intermediate horizon momentum exist in stocks of USA.
H3. An intermediate horizon momentum disappears when controlled for unrealized capital gain.
H4. The unrealized capital gain disappears when controlled for the momentum effect.
H5. The stock's cumulative return monotonically increases with the size of stocks.
H6. The stock's unrealized capital gain monotonically increases with the size of stocks.
H7. The financial crisis has impacts the relationship between momentum and disposition effect.

Weber and Welfens (2008) examined that there are two different perspectives of disposition effect. One is to hold the losing stocks for the long term and second is to sell winning stocks very early, and both behaviors are driven through different biases. They also suggest that researchers should separately examine each side, therefore we choose only selling perspective of disposition effect.

The paper follows further as; section 1 discuss about introduction, and previous studies which examined the disposition effect, momentum and their relationship in different markets. Section 2 consists of details regarding data and methodology used in the research, section 3 discuss the empirical results of total sample and sub samples and findings of hypothesis. Finally, section 4 concludes the study and discuss the implications, limitation and future directions of research.

2. Data and Methodology

To examine the relationship between momentum and disposition effect, daily data of closing prices, trading volume, total number of shares outstanding and market capitalization is taken from Center for Research in Security Prices (CRSP) for the period of January 1963 to December 2017 for all US common equities. We select share code 10 or 11 to exclude Real Estate Investment Trust (REITs), Shares of Beneficial Interests (SBIs), American Depository Receipts (ADRs), close ended fund companies and the companies incorporated outside USA. We use daily data to calculate the weekly cumulative returns over short horizon of 4 weeks ($r_{-4:-1}$), intermediate horizon for 5 to 52 weeks ($r_{-52:-5}$) and long horizon for 53 to 156 week ($r_{-53:-156}$). Daily trading volume and shares outstanding are also used to calculate the weekly turnover ratio (average trading volume divided by the number of shares outstanding).

To calculate the return price data is taken from CRSP data base, we calculate the weekly return from week t closing prices by using the formula: $r_t = (p_{t-1} - p_t)/p_t$ where, r_t is weekly return on stock, p_t is price of stock in time t and p_{t-1} is the price of stock in time t-1 (previous week). The individual stock return is used as dependent variable in our regressions.

The use cumulative return in short, intermediate and long horizon and unrealized capital gain as independent variables. Along with these independent variables, we also include market capitalization (firm size) and turnover as control variables because in literature it is found that size and turnover do impact both disposition effect and momentum. Cumulative returns are calculated from weekly stocks' return, for short horizon it is computed from four weeks' returns, intermediate horizon for 52 weeks' returns and long horizon for 156 weeks' returns. These cumulative returns are used as proxies for measuring momentum whereas unrealized capital gain used as proxy for disposition effect.

Grinblatt and Han (2005) recognized that momentum profits exist because there is positive relationship between expected return and capital gain. The unrealized capital gain or capital gain overhang is calculated as difference between current market price and the reference price (proxy for the aggregate cost basis). If the market price is higher (lower) than the reference price, the stock will be known as winner (loser) stock. Unrealized capital gain is considered to be a better predictor of future return than past momentum returns. Therefore, to measure the impact of disposition effect on predictability of return, it is required to calculate the unrealized capital gains. This measure important as it allow to calculate the gains and losses that stockholder may have on a particular date.

Following the methodology suggested by Grinblatt and Han (2005), we compute the reference price at the end of each week from January 1963 to December 2017 for every stock, using the previous five years data. Reference price is measured as:

$$R_{t-1} = 1/k \sum_{n=1}^{260} (V_{t-1-n} \prod_{\tau=1}^{n-1} [1 - V_{t-1-n+\tau}])\, P_{t-1-n}$$

Where Vt is the turnover in the stock on date t, P_{t-1-n} is the probability of shares purchased on date $t-1-n$ and then those had not been traded, k is a constant that makes the entire weights sum to one. And the unrealized capital gain is calculated as:

$$g_t = \frac{P_t - R_t}{P_t}$$

Further, it is required that the stocks must have historical data of at least five years as it is required for calculating the unrealized capital gains. If any of the stocks do not have five years data, then it is excluded from the analysis. This leads to our sample, which is consisting of 2709 weeks from January 1963 to December 2017.

For firm Size we first calculate the market capitalization by multiplying the price by number of shares outstanding and then taking natural log of market capitalization. Turnover is calculated by dividing the 52 weeks average trading volume by number of shares outstanding.

This research study uses Fama and Macbeth (1973) cross sectional regression to analyze the weekly average slope coefficients and t-statistics. The dependent variable is return of stock in week t, whereas the cumulative return over short, intermediate and long horizon are the explanatory variables to analyze the return effects as described by Jegadeesh and Titman (1993). Size (logarithm of market capitalization) is used as control variable to control the size premium effect of firm and volume (weekly turnover over the period of 52 weeks) is used as control variable.

Fama and Macbeth (1973) regression is performed on the following models:

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} \quad (1)$$

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 S \quad (2)$$

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V \quad (3)$$

$$r = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 g \quad (4)$$

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S \quad (5)$$

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S + \alpha_6 g \quad (6)$$

Where r_t represent the return on stock, $r_{t-4:-1}$ is short horizon cumulative returns, $r_{t-52:-5}$ is intermediate horizon cumulative returns, $r_{t-156:-53}$ shows long horizon cumulative returns, S depicts the size of firm (logarithm of market capitalization), V is average weekly turnover, and cg represents the unrealized capital gain overhang variable.

In model 1, only past cumulative stock returns over short, intermediate and long horizon are included as explanatory variable to check the effect of momentum on stock's return. Subsequently we control for the effect of size in model 2 and turnover in model 3 to test whether it effects the relationship between momentum and stock's return. In model 4, size and turnover are included along with momentum and further in model 5 we also include unrealized capital gain to examine the relationship between momentum and disposition effect after controlling size and turnover effect.

For robustness we also test the impact of major financial crisis and for that we divide that sample in sub periods. Initially we run the models on complete sample ranges from January 1963 to December 2017 and then on sub samples. Data is divided on the basis of two major crisis, dot com bubble and global financial crisis. The analysis is performed on three different samples ranges from: 1963 to 1994, 1995 to 2006 and 2007 to 2017. This analysis is performed to check whether crisis have impact on the relationship between momentum and disposition effect or not. We also consider the sample period of 1963 to 1996 to compare the results of this study with the results of research conducted by Grinblatt and Han (2005).

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3. Descriptive statistics

Panel A of Table 1 shows the descriptive statistics of variables which includes mean, standard deviation, 10th percentile, 50th percentile and 90th percentile. Mean values of cumulative returns in all horizons have positive values which shows that there is positive return on stocks but the 10th percentile value of all these returns are negative. The mean of capital gain is also positive which shows that on average, investors achieved capital gain during the period of January 1963 to December 2017.

In Panel B of Table 1, capital gain is used as dependent variable and the results shows that there is significant positive relationship between capital gain and past cumulative returns in all horizons. These results are similar to the findings of Grinblatt and Han (2005). Capital gain also has positive relationship with firm size reflect that larger firms have larger capital gain and positive relationship with turnover ratio show that reference price converges faster to the market price. The results also show that 21.91% cross sectional variation in capital gain is explained by cumulative returns, size and turnover.

The results of Table 1 are in line with our hypothesis that the capital gain has positive relationship with cumulative returns which shows that cumulative returns and capital gain move in same direction. We can say that if stock is performing well in past then it also has capital gain and vice versa.

Table 1: Descriptive statistics

Table 1 shows the result for the USA stocks for the period of January 1967 to December 2017. Panel A reports descriptive statistics which includes the mean, median and percentile of all variables used in the study; cumulative return over short horizon ($r_{t-4:-1}$), cumulative return over intermediate horizon ($r_{t-52:-5}$), cumulative return over long horizon ($r_{t-52:-5}$), size (S),, turnover (V), and capital gain (g_t) are used. Panel B includes results of regression test where capital gain (g_t) is dependent variable and cumulative return over short horizon ($r_{t-4:-1}$), cumulative return over intermediate horizon ($r_{t-52:-5}$), cumulative return over long horizon ($r_{t-156:-53}$) , size (S), turnover (V) is included as regressors.

Panel A: Time series average of summary statistics of the regressors

	$r_{t-4:-1}$	$r_{t-52:-5}$	$r_{t-156:-53}$	cg	S	V
Mean	0.0092	0.1034	0.2020	0.0042	12.1202	20.3792
Median	0.0000	0.0368	0.0659	0.4473	11.9570	10.0815
Std. dev	0.1356	0.5159	0.7914	2.5666	2.0421	34.3932
10th percentile	-0.1348	-0.3965	-0.4821	-1.1967	9.5986	1.2181
90th percentile	0.1556	0.6125	0.9337	1.0000	14.8589	49.6393

Panel B: Average coefficients and t-statistics for the regression $cg_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 S + \alpha_5 V$

α_0	α_1	α_2	α_3	α_4	α_5	R^2
-2.4640	0.0248	0.7664	0.5599	0.1952	0.0030	0.2191
(-46.22)	(20.3600)	(26.3100)	(44.4700)	(49.4700)	(5.9700)	

Disposition effect drives momentum

To investigate the relationship between disposition effect and momentum, we run Fama Macbeth (1973) regressions. The results are presented in Table 2. In model 1, we include the cumulative returns in short, intermediate and long horizon as independent variables. The results of Panel A of Table 2 demonstrate that the coefficients of intermediate horizon cumulative returns is positive and significant which shows that momentum exists in USA stock market for the period of January 1963 to December 2017. Short term and long horizon cumulative returns are negative which shows the reversal effect of stocks' return. These results are consistent with the results of Kong and Wang (2015) who found short and long horizon reversal in Chinese stocks.

In model 2 we include firm size as control variable along with cumulative returns. The results in Panel B show that the size is positively correlated to expected returns which depicts that expected returns increase with the size of stocks. However, after including size as control variable, intermediate horizon cumulative returns become insignificant. This shows that the effect of intermediate horizon momentum on average returns is size dependent. In Panel C we include the turnover as control variable along with cumulative returns. The results show that the inclusion of turnover does not impact the relation of cumulative returns with expected stock returns. The turnover has negative relationship with expected returns which shows that expected returns decrease when turnover is high.

Further, to examine the impact of capital gain on cumulative returns without controlling the effect of size and turnover, in Panel D we include cumulative returns and capital gain as independent variable. The results show that intermediate horizon cumulative returns become insignificant. Subsequently we include both control variables, size and turnover, along with cumulative returns in Panel E. The results shows that intermediate horizon cumulative returns and turnover are insignificant. This depicts that size have impact on the cumulative returns and turnover as without size both were significantly positive.

In Panel F, we include capital gain variable along with cumulative returns, size and turnover. According to Grinblatt and Han (2005), the intermediate cumulative returns become insignificant if unrealized capital gain variable is used as control variable and it shows that disposition drives momentum in stocks but if it does not change the significance of cumulative return then this shows that there are other variables which cause momentum in stocks. Our results show that intermediate horizon cumulative returns become insignificant after in presence of unrealized capital gain. It shows that disposition effect drive momentum during the sample period of January 1967 to December 2017.

The results of Table 2 show that there is existence of intermediate horizon cumulative returns in USA during the period of January 1967 to December 2007. These results are consistent with the findings of Jegadeesh and Titman (1993) that momentum exist in stock returns. Moreover, the result that the intermediate horizon cumulative returns, momentum, is derived by the disposition effect is consistent with and extends the findings of Grinblatt and Han (2005).

Table 2: Cross sectional regression estimates: 1967 to 2017

Table 2 represents the coefficients and t-statistics for the Fama and Macbeth (1973) cross sectional regressions for USA stocks from January 1967 to December 2017. Regression analysis is performed on weekly data andincludes only those stocks which have at least five year historical trading data. This study includes the variables which explain the relationship among stock return ($\boldsymbol{r_t}$), momentum [cumulative return over short horizon ($\boldsymbol{r_{t-4:-1}}$), cumulative return over intermediate horizon ($\boldsymbol{r_{t-52:-5}}$) and cumulative return over long horizon ($\boldsymbol{r_{t-156:-53}}$)], size [natural logarithm of market capitalization (S)], volume [weekly turnover over the period of 52 weeks (V)] and capital gain overhang (cg) . Panel A to Panel F includes the Fama and Macbeth (1973) regressions result for respective models.

Panel A

$$\boldsymbol{r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53}}$$

α_0	α_1	α_2	α_3	R^2
0.0016	-0.0243	0.0010	-0.0004	0.0317
(3.8700)	(-22.8200)	(2.6200)	(-2.4300)	

Panel B

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 S$$

α_0	α_1	α_2	α_3	α_4	R^2
-0.0111	-0.0229	-0.0002	-0.0010	0.0009	0.0495
(-9.9600)	(-21.3000)	(-0.5600)	(-6.0200)	(13.2400)	

Panel C

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V$$

α_0	α_1	α_2	α_3	α_4	R^2
0.0018	-0.0224	0.0009	-0.0005	-0.0001	0.043
(4.6500)	(-21.7400)	(2.6000)	(-3.1000)	(-1.0500)	

Panel D

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 cg$$

α_0	α_1	α_2	α_3	α_4	R^2
0.0008	-0.0239	0.0009	-0.0004	-0.0003	0.0957
1.6100	(-13.5500)	(1.4200)	(-1.1500)	(-0.7600)	

Panel E

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S$$

α_0	α_1	α_2	α_3	α_4	α_5	R^2
-0.0109	-0.0280	0.0001	-0.0009	0.0004	0.0009	0.0515
(-10.3000)	(-27.8400)	(0.0500)	(-6.7500)	(0.4300)	(13.7700)	

Panel F

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S + \alpha_6 cg$$

α_0	α_1	α_2	α_3	α_4	α_5	α_6	R^2
-0.0275	-0.0291	-0.0008	-0.0016	-0.0001	0.0023	-0.0009	0.1315
(-13.9300)	(-15.4200)	(-1.2400)	(-4.8400)	(-0.9100)	(15.6600)	(-4.1000)	

Momentum drives disposition effect

To see whether the momentum drive disposition effect we again use Fama and Macbeth (1973) regressions and the results are presented in Table 3. To examine this effect, we start with regressing the returns on capital gain variables in Panel A. The results show that the capital gain does not have any significant effect on the returns when used as only independent variable.

We then added cumulative returns to the model in Panel A, using one at time, starting with short horizon cumulative returns in Panel B. The results show that when used along with short horizon cumulative returns as independent variable, the capital gain has a significant negative impact on returns. However, the coefficient is significant at only 10% level. Panel C uses intermediate horizon cumulative returns as regressor along with capital gain. The effect of capital gain is similar to that of Panel B, but the significance level improves to 5%. Finally, the capital gain remains insignificant in the presence of long horizon cumulative returns (Panel D). To see the combined impact, we regressed the returns on capital gain along with three cumulative return variables. The results in Panel E show that the capital gain remains insignificant. These results seem strongly driven by long run horizon returns as the results in Panel D.

Finally in Panel F, we added two control variables of size and volume, which resulted in the model similar to that of Panel F in Table 2. The capital gain is again negative and significant at the 1% level. However, this does not show that the disposition effect drive momentum, as this is driven by size and volume.

The results of Table 3 shows that the momentum does not drive disposition, though short-term horizon change the significance of capital gain variable which shows that cumulative returns impact the capital gain on stocks but they are not the only factors which drive disposition effect[1].

In the next section, we analyze the impact of crisis on the relationship between disposition effect and momentum and for that we divide the sample in three sub-periods on basis of two major crisis (dot com bubble and global financial crisis).

Table 3: Cross sectional regression estimates: 1967 to 2017

Table 3 represents the coefficients and t-statistics for the Fama and Macbeth (1973) cross sectional regressions for USA stocks from January 1967 to December 2017. Regression analysis is performed on weekly data and includes only those stocks which have at least five year historical trading data. This study includes the variables which explain the relationship among stock return ($\boldsymbol{r_t}$), momentum [cumulative return over short horizon ($\boldsymbol{r_{t-4:-1}}$), cumulative return over intermediate horizon **(**$\boldsymbol{r_{t-52:-5}}$) and cumulative return over long horizon **(**$\boldsymbol{r_{t-156:-53}}$)], size [natural logarithm of market capitalization (S)], volume [weekly turnover over the period of 52 weeks (V)] and capital gain overhang (cg) . Panel A to Panel F includes the Fama and Macbeth (1973) regressions result for respective models.

Panel A

$$r_t = \alpha_0 + \alpha_1 cg$$

[1] We also test this hypothesis for subsamples and results are same as these are for whole sample period.

α_0	α_1	R^2
-0.5493	0.5509	0.0068
(-1.0000)	(1.0000)	

Panel B

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-4:-1}$

α_0	α_1	α_2	R^2
0.0017	-0.0002	-0.0273	0.0199
(3.6100)	(-1.6700)	(-21.3600)	

Panel C

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-52:-5}$

α_0	α_1	α_2	R^2
0.0012	-0.0005	0.0018	0.0250
(2.4000)	(-2.1500)	(4.1700)	

Panel D

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-156:-53}$

α_0	α_1	α_2	R^2
0.0013	-0.0002	-0.0001	0.0409
2.3800	(-0.5300)	(-0.1700)	

Panel E

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-4:-1} + \alpha_3 r_{t-52:-5} + \alpha_4 r_{t-156:-53}$

α_0	α_1	α_2	α_3	α_4	R^2
0.0008	-0.0003	-0.0239	0.0009	-0.0004	0.0957
1.6100	(-0.7600)	(-13.5500)	1.4200	(-1.1500)	

Panel F

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-4:-1} + \alpha_3 r_{t-52:-5} + \alpha_4 r_{t-156:-53} + \alpha_5 S + \alpha_6 V$

α_0	α_1	α_2	α_3	α_4	α_5	α_6	R^2
-0.0275	-0.0009	-0.0291	-0.0008	-0.0016	0.0023	-0.0001	0.1315
(-13.9300)	(-4.1000)	(-15.4200)	(-1.2400)	(-4.8400)	15.66	(-0.9100)	

Sub-period analysis

Studies have shown that both the momentum and disposition effects vary across different market conditions. In order to check the effects of two crises periods that occurred during of analysis period we have done sub-period analysis based on dot com bubble and global financial crises of 2008. Our sub-period include pre-dot com bubble period of 1967-1994, post-dot com bubble and pre-global financial crises period of 1995-2006, and post global financial crises period of 2007-2017. The results are presented in Tables 4 through 6.

In the pre dot com bubble period, there is significant short-term reversal in weekly returns as shown in Panel A of Table 4. There is significant long-term reversal in the presence of size in Panel B, and significant intermediate-term momentum when we include capital gain in Panel D. These results are in contradiction to that of Table 3 for the full sample. These results of show that for 1967-1994 period disposition effect does not drive momentum. Panel E and Panel F show that intermediate horizon cumulative returns are insignificant when controlled for size, turnover and capital gain. This shows that the size has more impact during this period compared to full sample.

Table 4: Cross sectional regression estimates: 1967 to 1994

Table 4 represents the coefficients and t-statistics for the Fama and Macbeth (1973) cross sectional regressions for USA stocks from January 1967 to December 1994. Regression analysis is performed on weekly data andincludes only those stocks which have at least five year historical trading data. This study includes the variables which explain the relationship among stock return ($\boldsymbol{r_t}$), momentum [cumulative return over short horizon ($\boldsymbol{r_{t-4:-1}}$), cumulative return over intermediate horizon **(**$\boldsymbol{r_{t-52:-5}}$) and cumulative return over long horizon **(**$\boldsymbol{r_{t-156:-53}}$)], size [natural logarithm of market capitalization (S)], volume [weekly turnover over the period of 52 weeks (V)] and capital gain overhang (cg) . Panel A to Panel F includes the Fama and Macbeth (1973) regressions result for respective models.

Panel A

$$\boldsymbol{r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53}}$$

α_0	α_1	α_2	α_3	R^2
-0.0045	-0.0432	-0.0134	-0.0067	0.2810
(-1.3500)	(-1.9700)	(-0.7800)	(-0.8100)	

Panel B

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 S$$

α_0	α_1	α_2	α_3	α_4	R^2
-0.0398	-0.0029	-0.003	-0.0386	0.0028	0.3270
(-0.9800)	(-0.0800)	(-0.3200)	(-1.7300)	(0.9200)	

Panel C

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V$$

α_0	α_1	α_2	α_3	α_4	R^2
0.0020	-0.0191	0.0005	0.0011	0.0001	0.3332
(1.1100)	(-1.3300)	(0.0900)	(0.3100)	(0.5200)	

Panel D

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 cg$$

α_0	α_1	α_2	α_3	α_4	R^2
0.0015	-0.0305	0.0028	0.0018	-0.0018	0.1768
(1.7200)	(-11.8000)	(2.5400)	(1.2600)	(-1.8900)	

Panel E

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S$$

α_0	α_1	α_2	α_3	α_4	α_5	R^2
0.1666	-0.0806	0.0777	0.0060	-0.0003	-0.0123	0.3636
0.8800	(-1.5200)	(0.9500)	(0.2000)	(-0.3900)	(-0.8700)	

Panel F

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S + \alpha_6 cg$$

α_0	α_1	α_2	α_3	α_4	α_5	α_6	R^2
-0.0267	-0.0365	-0.0001	-0.0020	0.0003	0.0022	-0.0008	0.2202
(-9.1300)	(-14.150)	(-0.0700)	(-3.8300)	(1.5700)	(9.9100)	(-3.3000)	

Table 5 shows the results for the pre-financial crisis and post dot com bubble period of 1995-2006. There is no reversal or momentum effect in the weekly returns, individually or in the presence of size, volume or capital gain. The capital gain itself remain insignificant in all panels. Hence, we conclude that the disposition effect does not drive momentum during 1995-2006 period. Further, it appears that none of the variable have any impact on the momentum.

The 2007-2017 period results are presented in Table 6. The results show that there exists significant short-term reversal in Panel A, which disappears when controlled for size and turnover in Panels B and C. There is no impact on intermediate horizon cumulative returns when we add capital gain in Panel D. However, it becomes significant in Panel C when we control for size. This shows that our results are somehow consistent with the findings of Muga and Santamaria (2007) about disappearance of momentum after 1997 crises in Spanish stock market.

To examine the effect of crises on the disposition and momentum relation we divide sample in three periods. We find that momentum does not exist in any period. The effects are different in different sub periods, fro example during the period 1967-1994 capital gain have more impact on the significance of intermediate cumulative returns, while during the period of 2007-2017 size is more impactful. None of the variables we considered have any impact on the intermediate horizon cumulative returns during period of 1995 to 2006. This shows that along with disposition effect, size also have impact on the cumulative returns in equity market.

Table 5: Cross sectional regression estimates: 1995 to 2006

Table 5 represents the coefficients and t-statistics for the Fama and Macbeth (1973) cross sectional regressions for USA stocks from January 1995 to December 2006. Regression analysis is performed on weekly data andincludes only those stocks which have at least five year historical trading data. This study includes the variables which explain the relationship among stock return ($\boldsymbol{r_t}$), momentum [cumulative return over short horizon ($\boldsymbol{r_{t-4:-1}}$), cumulative return over intermediate horizon ($\boldsymbol{r_{t-52:-5}}$) and cumulative return over long horizon ($\boldsymbol{r_{t-156:-53}}$)], size [natural logarithm of market capitalization (S)], volume [weekly turnover over the period of 52 weeks (V)] and capital gain overhang (cg) . Panel A to Panel F includes the Fama and Macbeth (1973) regressions result for respective models.

Panel A

$$\boldsymbol{r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53}}$$

α_0	α_1	α_2	α_3	R^2
0.0213	-0.4019	-0.1033	-0.0571	0.3783
1.13	(-1.0400)	(-0.9900)	(-0.9600)	

Panel B

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 S$$

α_0	α_1	α_2	α_3	α_4	R^2
-0.0632	-0.0033	-0.0037	-0.0012	0.0055	0.4164
(-2.5100)	(-0.6100)	(-1.4200)	(-0.3000)	(2.5400)	

Panel C

$$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V$$

α_0	α_1	α_2	α_3	α_4	R^2
-0.0006	-0.0101	0.0009	-0.0025	0.0001	0.5299
(-0.1600)	(-0.8600)	(0.2900)	(-0.8900)	(0.6500)	

Panel D

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 cg$

α_0	α_1	α_2	α_3	α_4	R^2
0.0011	-0.0009	-0.0023	0.0012	0.0008	0.2773
(0.6700)	(-0.0600)	(-1.000)	(1.3500)	(0.7400)	

Panel E

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S$

α_0	α_1	α_2	α_3	α_4	α_5	R^2
-0.3695	-0.0632	-0.1146	-0.0678	-0.0009	0.0256	0.5717
(-1.1300)	(-1.2800)	(-0.9300)	(-1.6000)	(-0.8800)	(1.1300)	

Panel F

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S + \alpha_6 cg$

α_0	α_1	α_2	α_3	α_4	α_5	α_6	R^2
-0.0479	-0.0461	0.0019	0.0047	0.0003	0.0035	-0.0050	0.3687
(-2.0300)	(-1.3700)	(0.2800)	(0.7100)	(1.8700)	(1.9800)	(-1.0600)	

Table 6: Cross sectional regression estimates: 2007 to 2017

Table 6 represents the coefficients and t-statistics for the Fama and Macbeth (1973) cross sectional regressions for USA stocks from January 2007 to December 2017.

. Regression analysis is performed on weekly data andincludes only those stocks which have at least five year historical trading data. This study includes the variables which explain the relationship among stock return ($\boldsymbol{r_t}$), momentum [cumulative return over short horizon ($\boldsymbol{r_{t-4:-1}}$), cumulative return over intermediate horizon **(**$\boldsymbol{r_{t-52:-5}}$) and cumulative return over long horizon **(**$\boldsymbol{r_{t-156:-53}}$)], size [natural logarithm of market capitalization (S)], volume [weekly turnover over the period of 52 weeks (V)] and capital gain overhang (cg) . Panel A to Panel F includes the Fama and Macbeth (1973) regressions result for respective models. The six panels of Table 6 represents six different models to test the hypothesis.

Panel A

$\boldsymbol{r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53}}$

α_0	α_1	α_2	α_3	R^2
0.0091	-0.0894	-0.0228	-0.0155	0.3509
(1.5400)	(-1.700)	(-0.9200)	(-0.9600)	

Panel B

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 S$

α_0	α_1	α_2	α_3	α_4	R^2
-0.0592	-0.0261	0.0129	0.0035	0.0041	0.3981
(-1.2800)	(-0.8400)	(1.8600)	(1.1200)	(1.2900)	

Panel C

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V$

α_0	α_1	α_2	α_3	α_4	R^2
-0.0006	-0.0101	0.0009	-0.0025	0.0001	0.5299
(-0.1600)	(-0.8600)	(0.2900)	(-0.8900)	(0.6500)	

Panel D

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 cg$

α_0	α_1	α_2	α_3	α_4	R^2
0.0085	-0.0153	0.0028	-0.0058	-0.0031	0.3445
(1.6000)	(-1.1700)	(0.9800)	(-0.6500)	(-1.4700)	

Panel E

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S$

α_0	α_1	α_2	α_3	α_4	α_5	R^2
-0.3695	-0.0632	-0.1146	-0.0678	-0.0009	0.0256	0.5717
(-1.1300)	(-1.2800)	(-0.9300)	(-1.6000)	(-0.8800)	(1.1300)	

Panel F

$r_t = \alpha_0 + \alpha_1 r_{t-4:-1} + \alpha_2 r_{t-52:-5} + \alpha_3 r_{t-156:-53} + \alpha_4 V + \alpha_5 S + \alpha_6 cg$

α_0	α_1	α_2	α_3	α_4	α_5	α_6	R^2
-0.0479	-0.0461	0.0019	0.0047	0.0003	0.0035	-0.0050	0.3687
(-2.0300)	(-1.3700)	(0.2800)	(0.7100)	(1.8700)	(1.9800)	(-1.0600)	

Studies have shown that both momentum and disposition effect vary across size, a finding similar to what we have concluded. To examine whether the relation of momentum and disposition effect also vary across size, we run Fama and Macbeth (1973) regressions foreach of the separate size deciles[2]. We did not find consistency in the results of regression across different size deciles. However, as shown Table 7 both capital gain and cumulative returns increases monotonically from smallest size decile to largest size decile. These results are consistent with exiting literature. However, we found no evidence supporting any impact of size on the relationship of disposition effect and momentum.

[2] We do not include the results for the purpose of brevity.

Table 7: Mean values

Table 7 represents the mean values for the stocks of USA from January 1967 to December 2017. This table includes the variables that are: momentum [cumulative return over short horizon ($\boldsymbol{r_{t-4:-1}}$), cumulative return over intermediate horizon ($\boldsymbol{r_{t-52:-5}}$) and cumulative return over long horizon ($\boldsymbol{r_{t-156:-53}}$)], volume [weekly turnover over the period of 52 weeks (V)] and capital gain overhang (cg).

Size	**Smallest**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**Largest**
$\boldsymbol{r_{t-4:-1}}$	-0.0526	-0.0286	-0.0139	-0.0039	0.0029	0.0090	0.0110	0.0134	0.0144	0.0118
$\boldsymbol{r_{t-52:-5}}$	-0.3404	-0.2068	-0.1006	-0.0155	0.0441	0.1125	0.1518	0.2115	0.1818	0.1562
$\boldsymbol{r_{t-156:-53}}$	-0.2609	-0.1462	-0.0502	0.0204	0.1110	0.2328	0.2747	0.3355	0.3530	0.2888
cg	-1.4994	-1.1505	-0.6185	-0.3724	-0.0631	0.0692	0.2620	0.2871	0.4309	0.4840

To test hypothesis 7 we run Fama Macbeth regression on basis of size deciles but did not find significant difference in results. In Table 7 we find monotonic relationship of cumulative returns and capital gain on size so we can say that size has impact but it is not confirmed by regression results.

4. Conclusion

This study analyzes the relationship between momentum and disposition effect in the stock market of USA for the period of January 1963 to December 2017. This study follows the methodology proposed by Grinblatt and Han (2005) to find that whether only disposition effect drives momentum or vice versa is also true.

To examine the relationship Fama and Macbeth (1973) cross sectional regression is used to study the weekly cross-sectional variations in momentum and disposition effect, and the results show that there is short and long horizon reversal in stocks while intermediate horizon momentum exists during January 1963 to December 2017. The intermediate horizon becomes insignificant when the size of a firm is controlled for and also when the capital gain variable is included as a control variable. These findings show that disposition effect drives momentum but not vice versa as capital gain does not disappear when intermediate horizon momentum is controlled for.

Moreover, for robustness, we performed the same analysis on sub-sample to check the impact of the crisis and find that these results are not same in all the examined periods. The results do not provide evidence for the existence of momentum effect in sub-samples analyzed in this study, but the significance of cumulative returns vary with the variables which are included as control variables. Therefore, we can conclude that there can be other factors which drive momentum in stocks of the USA other than the disposition effect.

This study also finds that along with the disposition effect, size also plays an important role as a determinant of the momentum effect. Therefore, we further analyze the relationship among momentum, disposition effect, and size of stock and find that cumulative return and capital gain vary with the size of stocks. Though regression results do not show this impact but mean values of cumulative returns and capital gain show that there is monotonically increase in cumulative returns from smallest to larger stocks except largest one whereas, unrealized capital gain increase monotonically from smallest to the largest size stocks.

Contribution and implications of study

This study contributes to the literature in a number of ways. Firstly, the momentum effect is analysed for larger sample covering the period of January 1963 to December 2017 on a weekly basis to test whether intermediate momentum also exists during this period. Momentum is a well- documented anomaly which is studied in different international markets. Also, this study examines the relationship between momentum and disposition effect during January 1963 to December 2017. Furthermore, the momentum effect and relationship between momentum and disposition effect is also analysed in sub-sample period for the stocks of USA as Hon and Tonks (2003) identified that momentum might only exist for certain time period in the stock market of UK. It is also important to study the impact of the crisis to evaluate the level of optimism/ pessimism in investors, therefore, sub-period analysis is performed on the basis of two financial crisis as this study can identify the impact of the crisis on the existence of momentum and its relationship with disposition effect. Moreover, the momentum effect and disposition effect may vary with the size of stocks, hence to identify the impact of stocks' size, this study examines the momentum and disposition effect in different size deciles.

This study has the implications for investors, portfolio managers, and academicians. For investors and portfolio managers it is beneficial in such a way that if they want to trade in the stock market of USA on the basis of winner and loser stocks, they must know the profitability of momentum trading strategies in different time periods and according to the size of stocks. Findings of this study will help them in choosing the size of stocks and the time period as a change in economic conditions do have an impact on the momentum strategies. Momentum strategies do not work in a same way for all the sample periods and for all size of stocks. Momentum is intermediate horizon effect whereas reversal can appear in short and long horizon, so investor should also consider holding period while forming the investment portfolio.

Academicians can use this study to analyze the well-documented anomaly momentum as a result of different risk attitude of investors along with other factors which may cause momentum in the stock market of USA.

Limitations and Future directions

There are a few limitations of this study which we have identified. The momentum effect has been documented in different classes of assets, therefore the relationship between momentum and disposition effect can be examined in the various class of assets. Our study is only conducted in the equity market of USA. Another limitation of this study is not to consider transaction cost explicitly as transaction cost has an effect on the price of stocks and ultimately it affects the holding period and trading volume (Vayanos,1998). Furthermore, this study performs the analysis solely based on quantitative data, it can be strengthened by including qualitative perspective (collecting data from brokers and determining holding period of stocks).

The profitability of momentum strategies vary across the countries as the risk attitude of investors is different in developed, developing and emerging economies. As this study found that along with disposition effect there can be other factors which may drive momentum in the stocks so other factors can also be used as control variables to explore that which factor is driving momentum in the stock market. The same analysis can be done to explore that which factor is driving the disposition effect. This study can also be performed at the industry level as it is also identified that the momentum effect varies from industry to industry.

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