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Article

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GENERAL & APPLIED ECONOMICS | GENERAL & APPLIED ECONOMICS

Momentum and disposition effect in the US stock market

Ranjeeta Sadhwani^{1*} and M. U. R. Bhayo¹

Abstract: This paper examines whether momentum drives the disposition effect and vice versa in the US stock market. The results from the analysis of the Fama-Macbeth regressions show that the disposition effect drives momentum but not the other way around. Furthermore, we find that this relationship varies over time. Along with the disposition effect, size also has an impact on the momentum. Therefore, the relationship between momentum and disposition effect is examined based on size deciles, and results demonstrate that the relationship does not vary significantly with the size of stocks. However, both the cumulative returns and capital gain varies monotonically with the size of stocks.

Subjects: Economic Psychology; Finance; Business, Management and Accounting

Keywords: behavioral finance; disposition effect; Fama-Macbeth regression; momentum

Subjects: G1; G4; G14; C50; C120

1. Introduction

Momentum refers to the phenomenon when the stocks that performed well (poor) in the past will continue to perform well (poor) in future periods, first identified by Jegadeesh and Titman (1993). Momentum anomaly shows that current stock returns are affected by past returns unrelated to risk (systematic or non-systematic). An investor who believes in the momentum effect will take a long position (short position) in past winner stocks (loser stocks). It is one of the well-documented



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PUBLIC INTEREST STATEMENT

The behavioral phenomenon known as the “Disposition effect” determines the investors’ behavior towards selling and buying stocks. It impacts the investment professional both directly (selling of winner stock quickly and holding loser stocks for too long) and indirectly (momentum effect in stocks that may also arise due to disposition effect and vice versa). It is a concern for academics and practitioners that how disposition effect and momentum can affect the investment strategies. This study analyzed whether the momentum drives the disposition effect and vice versa in the stock market of the US. The findings show that the disposition effect drives momentum but not the other way around. Furthermore, the results show that this relationship varies over time. Along with the disposition effect, size also has a significant impact on the momentum.

and persistent anomalies (Andrei & Cujean, 2017; Ansari & Khan, 2012; Barroso & Santa-Clara, 2015; Cakici et al., 2013; Cheng & Wu, 2010; Conrad & Kaul, 1998; Griffin et al., 2003; Hurn & Pavlov, 2003; Lo & MacKinlay, 1988; Rey & Schmid, 2007; Rouwenhorst, 1998).

The disposition effect is the tendency of the investors to sell the stocks whose price goes up (winning stocks) and hold the stocks whose price goes down (losing stocks). Researchers examined the presence of disposition effect among different types of investors and markets (Ben-David & Hirshleifer, 2012; Chang et al., 2016; Dhar & Zhu, 2006; Feng & Seasholes, 2005; Jin & Scherbina, 2010; Odean, 1998; Richards et al., 2015; Shapira & Venezia, 2001; Shefrin, 2007). It was first identified by Shefrin and Statman (1985), who suggested that investors tend to hold onto losing stocks compared to winning stocks. Their study was based on the characteristics proposed by Kahneman and Tversky (1979) in a critique of expected utility theory. Kahneman and Tversky (1979) proposed that investors consider changes in wealth, i.e., they perceive the outcome as loss or gain based on the reference point. The reference point is the basis for evaluation where investors compare the gains and losses by comparing the paid/invested amount. In their theory, called the prospect theory, Kahneman and Tversky (1979) argue that the investors are risk-seekers for the losses and risk-averse for the gains. 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 the impact of size on the relationship between momentum and disposition effect. An investor may believe that the stock price will converge to its fundamental value after a particular period, 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 exists for the short or intermediate horizon. Unlike previous studies, this study analyzes whether momentum drives the disposition effect in the US stock market.

Literature suggests that the 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), the investor decides to hold or sell the security and cause disposition effect. Like previous studies, we also test whether the disposition effect drives momentum because this study uses different sample period, which includes the Global Financial Crisis (GFC) and the dot-com bubble. Lin (2011) examines the disposition effect in the Taiwan and Chinese stock market during the 1997 Asian financial crisis and the 2008 global financial crisis, along with the effect in appreciation and depreciation periods. He finds that the disposition effect exists in both markets during the 1997 Asian financial crisis while only in the Chinese stock market during the 2008 global financial crisis. Therefore, subsample analysis is performed for robustness by incorporating two major crises (dot-com bubble and global financial crisis) to test whether the crisis changes the relationship between disposition effect and momentum.

Previous studies analyze the impact of size and momentum (e.g., Liu et al., 2011; Fama & French, 2012; Marshall & Cahan, 2005) and, size and disposition effect (e.g., Frazzini, 2006; Rangelova, 2001) and find that there is a relationship between size and momentum and, size and disposition effect. Therefore, in this study, we test whether size also impacts the relationship between momentum and disposition effect by examining the trends in cumulative returns and capital gain with the size of stocks.

The paper follows further as section I discuss the introduction. Section II reviews the previous studies that examined the disposition effect, momentum, and their relationship in different markets. Section III details the data and methodology used in this study. Section IV discusses the empirical results of the total sample and sub-samples and findings of the hypothesis. Finally, section V concludes the study and discusses the implications, limitations, and future research directions.

2. Literature review

Disposition and momentum effect are two anomalies of behavioral finance where earlier explains the investors' decision regarding buying and selling 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 affects equilibrium price and causes under-reaction to the news (Grinblatt & Han, 2005). If there is good news about stock, it creates a 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 the market, this cause capital loss 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 is sometimes linked to loss aversion. However, Grinblatt and Han (2005) suggest that two conditions are necessary to meet for loss aversion. First, the decline in utility for a loss must be greater than the increase for a gain of an equal amount. The second, a gamble that is always a loss relative to the reference point, generates higher utility than a certain loss. The reverse preference applies to gambles that are always gains. Another reason to hold loser stocks and sell winning stocks could be that the investors are risk seekers for losses. They consider mean reversion of returns (today's losers will outperform today's winners in the future). Andreassen (1988) did an experimental study and found 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, they do so in December to realize tax benefit as the end of a fiscal year is the time to realize the losses. Odean (1998) also finds that tax-motivated selling prevails in December. Kadous et al. (2014) focus on the loss side of the disposition effect and propose a psychological explanation for holding losing stocks. They find that if the investor believes in mean reversion, they do not drive the disposition effect. Their experiment shows that investors hold losing stocks too long to maintain a positive self-image.

Zuchel and Weber (2001) find that the 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 the disposition effect drives momentum in the US stock returns. They argue that because of the disposition effect, there is a spread between the fundamental value of stock and equilibrium price that shows the under-reaction of prices. Using the sample of 13,460 Chinese investors and firms from a large Shanghai brokerage firm, Shumway and Wu (2005, March) find that the disposition effect exists in most Chinese investors. Their results also suggest that the disposition effect drives momentum in stocks.

Researchers (Shumway & Wu, 2005, March; Goetzmann & Massa, 2008;; Frazzini, 2006) recognized that the disposition effect could delay the incorporation of news and induce the predictability of returns. It is also examined that the disposition effect can generate price momentum in the stocks whose prices vary due to the stock split, but it is not the only factor that drives momentum (Birru, 2015). Hur et al. (2010) find evidence in the sample of NYSE/AMEX/NASDAQ stocks that the disposition effect drives momentum more in stocks with more individual investors. Moreover, find that the effect of disposition effect induced momentum is greater in hard to value stocks. Kong et al. (2015) analyze the impact of the disposition effect on momentum in the Chinese market by using the model of Grinblatt and Han (2005) find that the disposition effect does not drive momentum in the Chinese stock market.

Weber and Welfens (2008) show that there are two different sides to the disposition effect. One is to hold the losing stocks for the long term, and the 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 the selling perspective of the disposition effect.

3. Data and methodology

We use daily data of closing prices, trading volume, number of shares outstanding and market capitalization from the Center for Research in Security Prices (CRSP) for January 1963 to December 2020 for all the 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 the US. We use daily data to calculate the weekly cumulative returns over the short horizon of 4 weeks ($r_{-4;-1}$), the intermediate horizon for 5 to 52 weeks ($r_{-52;-5}$), and the long horizon for 53 to 156 weeks ($r_{-53;-156}$). 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).

For the return calculation, the price data is taken from the CRSP database. We calculate the weekly return from week t closing prices by using the formula: $r_t = (p_t - p_{t-1})/p_{t-1}$ where, r_t is the weekly return on the stock, p_t is the price of the stock in time t and p_{t-1} is the price of the stock in time $t-1$ (previous week). The price data used to calculate return is the adjusted price, i.e., adjusted for the dividends. The individual stock return is used as the dependent variable in our regressions.

We use cumulative return in the short, intermediate, and long horizons 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 the literature suggests that the size and turnover impact both disposition effect and momentum. The cumulative returns are calculated from weekly stock returns for one month, one year, and three years. The short-horizon, intermediate-horizon, and long-horizon cumulative returns are computed over four weeks, 52 weeks, and 156 weeks, respectively. These cumulative returns are used as proxies for measuring momentum, whereas unrealized capital gain is used to proxy for disposition effect.

Grinblatt and Han (2005) recognized that momentum profits exist because of a positive relationship between expected return and capital gain. The unrealized capital gain or capital gain overhang is calculated as the difference between the current market price and the reference price (a proxy for the aggregate cost basis). If the market price is higher (lower) than the reference price, the stock will be the 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 gain for each stock in our sample. This measure is important as it calculates the gains and losses that stockholders 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 2020 for every stock, using the previous five years' data. The reference price is measured as:

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

Where V_t 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 have not been traded, k is a constant that makes the entire weights sum to one. The unrealized capital gain is then 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-year data, it is excluded from the analysis.

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

We use Fama and MacBeth (1973) cross-sectional regressions to analyze the weekly average slope coefficients and *t*-statistics. In the regression to test for momentum in returns, the dependent variable is the return of the stock in week *t*, whereas the cumulative return over the short, intermediate, and long horizon are the explanatory variables. Size (logarithm of market capitalization) is used to control the size effect of the firm, and volume (weekly turnover over 52 weeks) is used as a control for possible effects of volume (see Lee and Swaminathan, 2000; and Gervais et al., 2001).

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

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

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

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

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

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

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

Where r_t represent the return on the 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 the firm (logarithm of market capitalization), *V* is average weekly turnover, and *cg* represents the unrealized capital gain overhang.

In model 1, only past cumulative stock returns over the short, intermediate, and long-horizon are included as the explanatory variables to check the momentum effect on stock's return. Subsequently, we control the effect of size in model 2 and turnover in model 3 to test whether it affects the relationship between momentum and stock's return. In model 4, the capital gain is included as a control variable whereas, size and turnover are included along with cumulative returns in model 5. Further in model 6, 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 the major financial crisis, and for that, we divide the sample into sub-periods. Initially, we run the models on complete sample ranges from January 1963 to December 2020 and then subsamples. Data is divided based on major crises, the dot com bubble, the global financial crisis, and Bretton Wood Fixed Exchange Rate failure. The analysis is performed on three different samples ranges from 1963 to 1994, 1995 to 2006, and 2007 to 2020. For robustness, pre and post regime of Bretton Wood Exchange Rate failure analysis has also been performed. This analysis is performed to check whether crises impact the relationship between momentum and disposition effect or not. We also performed analysis for the sample between 1963 and 1996 to compare the results with Grinblatt and Han (2005).

4. Descriptive statistics

Panel A of [Table 1](#) shows the descriptive statistics of variables, including average, standard deviation, 10th percentile, 50th percentile, and 90th percentile. The average values of cumulative returns in all horizons have positive values, which shows that the stocks are earning a positive return. However, the 10th percentile value of all these returns is negative, which indicates that some stocks are earning negative returns. The average capital gain is also positive, showing that investors realized capital gain from January 1963 to December 2020.

In Panel B of [Table 1](#), the capital gain is used as a dependent variable. The results show a significant positive relationship between capital gain and past cumulative returns in all horizons. Capital gain also has a positive relationship with the firm size showing that the larger firms have a higher capital gain. The relationship with the turnover ratio is positive, which shows that reference price converges faster to the market price. The results also show that cumulative returns, size, and turnover explain 19.08% cross-sectional variation in capital gain. These results are similar to the findings of Grinblatt and Han (2005).

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

5. The disposition effect drives momentum

To investigate the relationship between disposition effect and momentum, we run Fama and MacBeth (1973) regressions. The results are presented in [Table 2](#). In model 1, we include the cumulative returns in the short, intermediate, and long horizons as independent variables. The results of Panel A of [Table 2](#) demonstrate that the coefficient of intermediate horizon cumulative returns is positive and significant, which shows that momentum exists in the US stock market from January 1963 to December 2020. Short-term and long-horizon cumulative returns are negative, which shows the reversal effect of stocks' returns. These results are consistent with the results of Kong et al. (2015), who found a short and long-horizon reversal in Chinese stocks.

In model 2, we include firm size as a control variable along with cumulative returns. The results in Panel B show that the size is positively related to expected returns, which depicts that expected returns increase with the size of stocks. However, after including size as a 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 a control variable along with cumulative returns. The results show that the inclusion of turnover does not impact the relation of short-term and intermediate cumulative returns with expected stock returns. However, it has an impact on the significance of long-horizon returns. The turnover has a negative relationship with expected returns, which shows that expected returns decrease when turnover is high.

Further, to examine the impact of the capital gain on cumulative returns without controlling the effect of size and turnover, we include cumulative returns and capital gain as the independent variables in Panel D. 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 show that intermediate and long-term cumulative returns become insignificant. Also, the size becomes insignificant when turnover is included in the model.

In Panel F, we include the capital gain variable along with cumulative returns, size, and turnover. According to Grinblatt and Han (2005), the intermediate cumulative returns become insignificant if the unrealized capital gain variable is used as a control variable, and it shows that disposition drives momentum in stocks. However, if it does not change the significance of cumulative return, then this shows that other variables cause momentum in stocks. Our results show that intermediate horizon

Table 1. Descriptive statistics

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
Average	0.0040	0.0484	0.1197	0.4353	13.1710	7.7330
Median	0.0015	0.0289	0.0626	0.2015	13.0720	3.8218
Std. dev	0.5999	0.2185	0.3947	3.6575	1.8257	25.9344
10th percentile	-0.0534	-0.1667	-0.2309	-0.3402	10.9449	0.9767
90th percentile	0.0616	0.2696	0.4918	0.6782	15.5420	14.4697

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
-2.9223	0.9452	0.6869	0.2942	0.1981	0.3759	0.1908
(-18.41)	(12.25)	(14.18)	(9.34)	(17.90)	(6.62)	

Table 1 shows the result for the USA stocks for the period of January 1967 to December 2020. 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 ($r_{t-156:-53}$), 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.

cumulative returns become insignificant in the presence of unrealized capital gain. It shows that the disposition effect drives momentum during the sample period of January 1967 to December 2020.

The results of Table 2 show that there is the existence of intermediate horizon cumulative returns in the US stock returns from January 1967 to December 2020. These results are consistent with the findings of Jegadeesh and Titman (1993) that momentum exists 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).

6. Momentum drives disposition effect

To see whether the momentum drives the 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 significantly affects the returns when used as the only independent variable.

We then added cumulative returns to the model in Panel A, using one variable at a time, starting with short horizon cumulative returns in Panel B. The results show that when used along with short horizon cumulative returns as the independent variable, the capital gain has still a significant impact on returns. Panel C uses intermediate horizon cumulative returns as regressor along with capital gain. The effect of capital gain is similar to that of Panel A and Panel B. Finally, the capital gain remains also significant in the presence of long horizon cumulative returns in 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 significant.

Finally, in Panel F, we added the control variables, size and volume, which resulted in a model similar to Panel F in Table 2. The results of Table 3 show that the momentum does not drive disposition effect. However, long-term cumulative returns change the significance of the capital gain variable, which shows that cumulative returns impact the capital gain on stocks. However, they are not the only factors that drive the disposition effect.¹

In the next section, we analyze the impact of the crisis and exchange rate regime shift on the relationship between disposition effect and momentum, and for that, we divide the sample into three subsamples based on two major crises (dot com bubble and global financial crisis), and two subsamples for pre and post Bretton wood currency system failure.

Table 2. Cross sectional regression estimates: 1967 to 2020

Panel A

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

α_0	α_1	α_2	α_3	R^2
0.0007	-0.0029	0.0010	-0.0001	0.032
(2.77)	(-2.53)	(3.36)	(-2.36)	

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
0.0004	-0.0026	0.0001	-0.0000	0.0002	0.0411
(0.39)	(-2.24)	(0.5600)	(-0.05)	(12.42)	

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
0.0003	-0.0027	0.0017	0.0001	-0.0037	0.0430
(0.84)	(-2.43)	(3.57)	(0.26)	(-0.32)	

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
0.0010	-0.0078	-0.0025	-0.0019	0.0049	0.0473
(5.37)	(-6.33)	(1.42)	(-6.69)	(10.10)	

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
-0.0007	-0.0028	0.0010	0.0004	-0.1658	0.0001	0.0507
(-0.95)	(-2.44)	(0.22)	(0.82)	(-1.46)	(1.55)	

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
0.0041	-0.0081	-0.0033	-0.0022	0.0088	-0.0002	0.0057	0.0652
(5.75)	(-6.28)	(-1.24)	(-7.43)	(0.74)	(-4.44)	(5.75)	

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 2020. Regression analysis is performed on weekly data and includes stocks with at least five years historical trading data. This study includes the variables which explain the relationship among stock return (r_t), momentum [cumulative return over short horizon ($r_{t-4:-1}$)], cumulative return over intermediate horizon ($r_{t-52:-5}$) and cumulative return over long horizon ($r_{t-156:-53}$), size [natural logarithm of market capitalization (S)], and volume [weekly turnover over 52 weeks (V)] and capital gain overhang (cg). Panel A to Panel F includes the Fama and MacBeth (1973) regressions result for respective models.

7. Sub-period analysis

Studies have shown that the momentum and disposition effects vary across market conditions (Abinzano et al., 2010; Cooper et al., 2004; Lee et al., 2013). In order to check the effects of two crises periods that occurred during of analysis period, we have done a sub-period analysis based on the dot com bubble and global financial crises of 2008. Our sub-period includes the 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 2007–2020. The results are presented in Table 4 through 6.

There is a significant short-term reversal in weekly returns in the pre dot com bubble period, as shown in Panel A of Table 4. There is a significant long-term reversal in the presence of size in Panel B, and significant intermediate-term momentum when we include the capital gain in Panel

Table 3. Cross-sectional regression estimates: 1967 to 2020

Panel A

$r_t = \alpha_0 + \alpha_1 cg$		
α_0	α_1	R^2
0.0012	0.0015	0.0205
(5.37)	(8.18)	

Panel B

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-4:-1}$			
α_0	α_1	α_2	R^2
0.0011	0.0020	-0.0049	0.0299
(5.19)	(10.19)	(-4.27)	

Panel C

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-52:-5}$			
α_0	α_1	α_2	R^2
0.0010	0.0027	-0.0008	0.0291
(4.72)	(10.02)	(-2.08)	

Panel D

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-156:-53}$			
α_0	α_1	α_2	R^2
0.0012	0.0017	-0.0005	0.0279
(5.52)	(7.96)	(-2.63)	

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
0.0010	0.0049	-0.0078	-0.0025	-0.0019	0.0473
(5.37)	(10.10)	(-6.33)	(1.42)	(-6.69)	

Panel F

$r_t = \alpha_0 + \alpha_1 cg + \alpha_2 r_{t-4:-1} + \alpha_3 r_{t-52:-5} + \alpha_4 r_{t-156:-53} + \alpha_5 V + \alpha_6 S$							
α_0	α_1	α_2	α_3	α_4	α_5	α_6	R^2
0.0041	0.0057	-0.0081	-0.0033	-0.0022	0.0088	-0.0002	0.0652
(5.75)	(5.75)	(-6.28)	(-1.24)	(-7.43)	(0.74)	(-4.44)	

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 2020. This table show whether momentum drives disposition effect or not. Regression analysis is performed on weekly data and includes stocks with at least five years historical trading data. This study includes the variables which explain the relationship among stock return (r_t), momentum [cumulative return over short horizon ($r_{t-4:-1}$), cumulative return over intermediate horizon ($r_{t-52:-5}$) and cumulative return over long horizon ($r_{t-156:-53}$)], size [natural logarithm of market capitalization (S)], and volume [weekly turnover over 52 weeks (V)] and capital gain overhang (cg). Panel A to Panel F includes the Fama and MacBeth (1973) regressions result for respective models.

D. These results contradict the results of Table 3 for the full sample. These results show that for the 1967–1994 period, the 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 is the main driver of the momentum, not the disposition effect.

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 remains insignificant in all panels. Hence, we conclude that the disposition effect does not drive momentum during the 1995–2006 period. Further, it appears that none of the variables have any impact on the momentum.

The 2007–2020 period results are presented in [Table 6](#). The results show a significant short-term reversal in Panel A, which disappears when controlled for size and turnover in Panels B and C. There is an impact on intermediate horizon cumulative returns when we add capital gain in Panel D, but there is reversal rather than momentum. However, it becomes significant in Panel C when we control for size. Our results are consistent with the findings of Muga and Santamaria (2007) about the disappearance of momentum after the 1997 crisis in the Spanish stock market.

To examine the effect of crises on the relationship between disposition effect and momentum, we divide the sample into three sub-periods. We find that momentum does not exist in any period. The effects are different in different sub-periods. For example, during the period 1967–1994, the capital gain has more impact on the significance of intermediate cumulative returns, while from 2007 to 2020, size is more impactful. None of the variables we considered have any impact on the intermediate horizon cumulative returns from 1995 to 2006. This shows that, along with the disposition effect, size also impacts the cumulative returns in the equity market.

For robustness, we also examine the period before and after the Bretton Woods system of fixed exchange rate failure. The results are different before and after the failure of the Bretton Woods system, as shown in [Tables 7](#) and [Tables 8](#). During the period 1967–1973 in [Table 7](#), there persists momentum returns in the US stock market, and the significance level did not change even after including other control variables. The short-term and long-term horizon returns become significant after including capital gain as a control variable.

Whereas intermediate horizon returns are insignificant during the period 1974–2020 ([Table 8](#)), the impact can be because of the failure of the system and its impact on investor behavior. After controlling the size and turnover effect, the intermediate cumulative returns become significant, whereas the momentum returns disappear in the presence of capital gain.

The literature shows that both momentum and disposition effects vary across size (Egginton et al., 2019), a finding similar to what we have concluded. To examine whether the relationship between momentum and disposition effect also varies across size, we run Fama and MacBeth (1973) regressions for each of the separate size deciles.² We did not find consistency in the results of regression across different size deciles. However, as shown in [Table 9](#), both capital gain and cumulative returns increase monotonically from smallest size decile to largest size decile. These results are consistent with the existing literature. However, we found no evidence supporting an impact of size on the relationship of disposition effect and momentum.

We ran Fama-Macbeth regression based on size deciles but did not find a significant difference in results. In [Table 9](#), we find the monotonic relationship of cumulative returns and capital gain on size, so we can say that size has an impact, but regression results do not confirm it.

8. Conclusion

This study examined the relationship between momentum and disposition effect in the stock market of the US for the period of January 1963 to December 2020. This study follows the methodology Grinblatt and Han (2005) proposed to find that whether only disposition effect drives momentum or vice versa is also true.

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

Table 4. Cross-sectional regression estimates: 1967 to 1994

Panel A

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

α_0	α_1	α_2	α_3	R^2
-0.0045	-0.0432	-0.0134	-0.0067	0.2810
(-1.35)	(-1.97)	(-0.78)	(-0.81)	

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
(-0.98)	(-0.08)	(-0.32)	(-1.73)	(0.92)	

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
(1.11)	(-1.33)	(0.09)	(0.31)	(0.52)	

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
(1.72)	(-11.80)	(2.54)	(1.26)	(-1.89)	

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
(0.88)	(-1.52)	(0.95)	(0.20)	(-0.39)	(-0.87)	

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
(-9.13)	(-14.15)	(-0.07)	(-3.83)	(1.57)	(9.91)	(-3.30)	

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 and includes stocks with at least five year historical trading data. This study includes the variables which explain the relationship among stock return (r_t), momentum [cumulative return over short horizon ($r_{t-4:-1}$), cumulative return over intermediate horizon ($r_{t-52:-5}$) and cumulative return over long horizon ($r_{t-156:-53}$)], 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.

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

This study also finds that along with the disposition effect, size is one of the determinants of the momentum effect. Therefore, we further analyze the relationship among momentum, disposition effect, and size of the stock and find that cumulative return and capital gain vary with the size of stocks. Though regression results do not show this impact, mean values of cumulative returns and capital gain show a monotonic increase in cumulative returns from smallest to larger stocks.

Table 5. Cross-sectional regression estimates: 1995 to 2006

Panel A

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

α_0	α_1	α_2	α_3	R^2
0.0213	-0.4019	-0.1033	-0.0571	0.3783
(1.13)	(-1.04)	(-0.99)	(-0.96)	

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
(-2.51)	(-0.61)	(-1.42)	(-0.30)	(2.54)	

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
(-0.16)	(-0.86)	(0.29)	(-0.89)	(0.65)	

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
(0.67)	(-0.06)	(-1.00)	(1.35)	(0.74)	

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
(-1.13)	(-1.28)	(-0.93)	(-1.60)	(-0.88)	(1.13)	

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
(-2.03)	(-1.37)	(0.28)	(0.71)	(1.87)	(1.98)	(-1.06)	

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

Disposition effect plays an important role in inducing momentum in the stocks. The investors may consider the behavioral phenomenon (disposition effect) while forming investment strategies and also the impact of economic conditions such as financial crisis for investment decisions. Further, while analyzing the profitability of momentum strategy, investors must also consider the behavior of other investors in the market who can sell the winning stocks immediately and hold the loser stocks and it leads to fluctuations in market prices and ultimately the profitability of momentum strategies.

9. Contribution and implications of the study

This study contributes to the literature in many ways. Firstly, the momentum effect is analyzed for a larger sample covering the period of January 1963 to December 2020 on a weekly basis to test whether intermediate momentum also exists during this period. Momentum is a well-documented

Table 6. Cross sectional regression estimates: 2007 to 2020

Panel A

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

α_0	α_1	α_2	α_3	R^2
-0.0001	-0.0070	0.0001	0.0008	0.0924
(-0.16)	(-1.68)	(-0.07)	(1.01)	

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
-0.0012	-0.0261	0.0009	0.0003	0.0001	0.1119
(-0.38)	(-0.8400)	(1.84)	(0.39)	(0.28)	

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
-0.0012	-0.0056	0.0029	-0.0006	0.0143	0.1107
(-0.76)	(-0.142)	(1.64)	(-0.83)	(0.33)	

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
0.0007	-0.0215	-0.1195	-0.0064	0.0158	0.1282
(1.16)	(-4.93)	(-6.46)	(-5.99)	(8.63)	

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
-0.0049	-0.0050	0.0010	0.0004	-0.0645	0.0002	0.1277
(-1.85)	(-1.17)	(0.82)	(0.55)	(-1.46)	(1.63)	

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
0.0072	-0.0212	-0.1481	-0.0074	0.0344	-0.0003	0.0185	0.1616
(2.81)	(-4.57)	(-6.98)	(-6.84)	(0.74)	(-2.23)	(8.35)	

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 2020. Regression analysis is performed on weekly data and includes stocks with at least five year historical trading data. This study includes the variables which explain the relationship among stock return (r_t), momentum [cumulative return over short horizon ($r_{t-4:-1}$)], cumulative return over intermediate horizon ($r_{t-52:-5}$) and cumulative return over long horizon ($r_{t-156:-53}$), size [natural logarithm of market capitalization (S)], volume [weekly turnover over 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.

anomaly that is studied in different international markets. Also, this study examines the relationship between momentum and disposition effect from January 1963 to December 2020. Furthermore, the momentum effect and relationship between momentum and disposition effect are also analyzed in sub-periods for the US stocks. Hon and Tonks (2003) identified that momentum might only exist for a certain time period in the stock market of the 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 based on two financial crises as this study can identify the impact of the crisis on the existence of momentum and its relationship with the 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.

Table 7. Cross sectional regression estimates: 1967 to 1973

Panel A

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

α_0	α_1	α_2	α_3	R^2
0.0013	-0.0012	0.0020	-0.0004	0.0124
(3.25)	(-0.81)	(4.53)	(-0.17)	

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
0.0022	-0.0023	0.0019	0.0001	0.0001	0.019
(1.82)	(-1.55)	(4.49)	(0.05)	(1.03)	

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
0.0012	-0.0013	0.0019	-0.0001	0.0001	0.0244
(3.66)	(-0.95)	(5.12)	(-0.28)	(0.75)	

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	-0.0031	0.0013	-0.0003	0.0019	0.0203
(4.35)	(-2.10)	(3.08)	(-1.29)	(10.01)	

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
0.0016	-0.0022	0.0017	0.0000	0.0001	-0.0003	0.0303
(1.39)	(-1.61)	(4.98)	(0.04)	(0.65)	(-0.47)	

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
0.0042	-0.0038	0.0011	-0.0003	0.0002	-0.0020	0.0020	0.0365
(5.75)	(-2.85)	(3.15)	(-1.29)	(0.28)	(-2.65)	(11.86)	

Table 7 represents the coefficients and t-statistics for the Fama and MacBeth (1973) cross sectional regressions for USA stocks from January 1967 to December 1973. Regression analysis is performed on weekly data and includes only those stocks with at least five years historical trading data. This study includes the variables which explain the relationship among stock return (r_t), momentum [cumulative return over short horizon ($r_{t-4:-1}$)], cumulative return over intermediate horizon ($r_{t-52:-5}$) and cumulative return over long horizon ($r_{t-156:-53}$], size [natural logarithm of market capitalization (S)], volume [weekly turnover over 52 weeks (V)] and capital gain overhang (cg). Panel A to Panel F includes the Fama and MacBeth (1973) regressions result for respective models.

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

Academicians can use this study to analyze the well-documented anomaly momentum resulting from different risk attitudes of investors and other factors that may cause momentum in the stock market of the US.

Table 8. Cross sectional regression estimates: 1974 to 2020

Panel A

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

α_0	α_1	α_2	α_3	R^2
0.0006	-0.0033	0.0008	0.0001	0.0353
(2.06)	(-2.42)	(1.61)	(0.47)	

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
0.0022	-0.0027	0.0009	0.0001	0.0001	0.0449
(1.82)	(-1.99)	(2.57)	(0.04)	(0.09)	

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
0.0002	-0.0029	0.0016	0.0001	-0.0043	0.0453
(0.44)	(-2.30)	(2.99)	(0.31)	(-0.33)	

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
0.0010	-0.0086	-0.0032	-0.0022	0.0010	0.0519
(4.42)	(-6.06)	(-5.42)	(-6.59)	(4.42)	

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
-0.0011	-0.0030	0.0009	0.0001	-0.0194	0.0001	0.0541
(-1.29)	(-2.20)	(2.43)	(0.22)	(-1.46)	(1.74)	

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
0.0042	-0.0088	-0.0041	-0.0025	0.0103	-0.0002	0.0063	0.0701
(5.10)	(-5.92)	(-6.24)	(-7.35)	(0.74)	(-3.92)	(9.16)	

Table 8 represents the coefficients and t-statistics for the Fama and MacBeth (1973) cross sectional regressions for USA stocks from January 1974 to December 2020. Regression analysis is performed on weekly data and includes stocks with at least five years historical trading data. This study includes the variables which explain the relationship among stock return (r_t), momentum [cumulative return over short horizon ($r_{t-4:-1}$)], cumulative return over intermediate horizon ($r_{t-52:-5}$) and cumulative return over long horizon ($r_{t-156:-53}$), 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.

10. Limitations and future directions

There are a few limitations of this study that 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 US equity market. Another limitation of this study is not to consider transaction cost explicitly as transaction cost affects 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 a qualitative perspective (collecting data from brokers and determining the holding period of stocks).

The profitability of momentum strategies varies across the countries as the risk attitude of investors is different in developed, developing, and emerging economies. This study found that

Table 9. Mean values

Size	Smallest	20	30	40	50	60	70	80	90	Largest
$r_t - 4 : -1$	-0.0039	-0.0239	-0.0286	0.00391	0.0040	0.0041	0.0043	0.0134	0.0144	0.036
$r_{t-52:-5}$	0.046	0.049	0.051	0.0584	0.0586	0.0590	0.1528	0.205	0.221	0.236
$r_{t-156:-53}$	-0.5312	-0.5283	-0.3418	-0.0224	-0.1721	-0.1328	-0.0864	-0.0618	0.0375	0.2567
cg	-1.5112	-0.1198	0.1216	0.1218	0.1372	0.1629	0.1954	0.1984	0.2657	0.4718

Table 9 represents the mean values for the stocks of USA from January 1967 to December 2020. This table includes the variables that are: momentum [cumulative return over short horizon ($r_{t-4:-1}$), cumulative return over intermediate horizon ($r_{t-52:-5}$) and cumulative return over long horizon ($r_{t-156:-53}$)], volume [weekly turnover over 52 weeks (V)] and capital gain overhang (cg)

along with the disposition effect, there can be other factors that may drive momentum in the stocks, so other factors can also be used as control variables to explore 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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Notes

1. We also test this hypothesis for subsamples and results are same as these are for whole sample period.
2. We do not include the results for the purpose of brevity.

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