

# Price Reversal and Firm Size in the U.S. Stock Markets, New Evidence

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**Abstract**—This study investigates the return behaviors of U.S. stocks listed in NYSE, AMEX, NASDAQ and NYSE ARCA from July 1963 to December 2007. Past studies are inconclusive as they either report short term momentum and long term reversal or vice versa or ambiguous trends. This is the first study that reports significant short and long term price reversal of U.S. stocks under some conditions by sorting them first by past return or price ratio and then by market capitalization (2 sorts) instead of what are done by most of the past studies by just sorting stocks by either past return or price ratio (1 sort). We also show that for stocks from the loser, medium or winner groups, small capitalization stocks always significantly outperform large capitalization stocks in the future.

## I. METHODOLOGY AND DATA

In each month from July 1963 to December 2002 we sort NYSE-AMEX-NASDAQ-NYSE/ARCA stocks by previous 3, 6, 9 or 12 months (length of sort periods=3, 6, 9 and 12 respectively) return using the JT (Jegadeesh and Titman 1993) and MG (Moskowitz and Grinblatt 1999) methods and the ratio of closing price to previous 3, 6, 9 or 12 months high (price ratio) by GH (George and Hwang 2004) methods into 3, 5 or 10 groups. The sorting ends in December 2002 because we need to calculate the next 60th month return which needs stock return from January 2003 to December 2007. At month  $t$ , the previous  $n$  month return  $PR_{t,n}$  is the cumulative return from months  $t-n+1$  to  $t$  where  $n=3, 6, 9$  or  $12$  and  $t=$ July 1963 to December 2007. The previous  $n$  month price ratio  $PP_{t,n}$  is the ratio of closing price at end of month  $t$  to the highest closing price from months  $t-n+1$  to  $t$ :

$PP_{t,n}$  = closing price at end of month  $t$  / highest closing price from

$$\text{months } t-n+1 \text{ to } t \quad (1)$$

In each month  $t$ , winners are groups with the highest return ( $PR_{t,n}$ , JT method) or price ratio ( $PP_{t,n}$ , GH method), medium return are groups with medium return or price ratio and losers are groups with the lowest return or price ratio. In each of the winner, medium or loser groups we again sort the stocks into 3, 5 or 10 groups by market capitalization (stocks with largest market capitalization are called large capitalization groups, medium market capitalization medium cap and smallest market capitalization small cap).

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1) Loser/large capitalization are the groups of stocks with loser return or price ratio and largest market capitalization and 2) the group of stocks with loser return or price ratio and medium market capitalization are called the loser/medium capitalization groups. Likewise, 3) loser/small capitalization groups are stocks with loser return or price ratio and smallest market capitalization, 4) medium/large capitalization are those with medium return or price ratio and largest capitalization, 5) medium – small capitalization are those with medium return or price ratio and smallest capitalization, 6) winner/large capitalization are those with winner return or price ratio and largest capitalization, 7) winner/medium capitalization are those with winner return or price ratio and medium capitalization and 8) winner/small capitalization are those with winner return or price ratio and smallest capitalization. The monthly return of the above 8 combination groups at the end of next 3 – 12 months and 18 - 60 months are then calculated by the JT approach. For example in December 2002, the next 60th month return will be 1/60 determined by the portfolio return in December 2007 (This is why the sorting has to end in December 2002 because we only have CRSP data until December 2007) of the stocks formed on December 2002 by ranking the stocks by  $PR_{December\ 2002, n}$  ( $n=3, 6, 9$  or  $12$  and similarly for  $PP_{December\ 2002, n}$ ) and then by market capitalization in December 2002, 1/60 determined by the portfolio return in November 2007 of the stocks formed on November 2002 by ranking the stocks by  $PR_{November\ 2002, n}$  (similarly for  $PP_{November\ 2002, n}$ ) and then by market capitalization in November 2002, ..... and 1/60 determined by the portfolio return in January 2003 of the stocks formed in January 1998 by ranking the stocks by  $PR_{January\ 1998, n}$  (similarly for  $PP_{January\ 1998, n}$ ) and then by market capitalization in January 1998. Returns for the next 3, 6, 9, 12, 18, 24, 30, 36, 42, 48, and 54 month are done in a similar fashion.

The table below is the return of winner/small capitalization groups minus return of loser/small capitalization groups sorted by return and then by market capitalization. In each month from July 1963 to December 2007 we sort NYSE-AMEX-NASDAQ-NYSE/ARCA stocks by previous 3, 6, 9 or 12 months (length of sort periods=3, 6, 9 and 12 respectively) return using the JT (Jegadeesh and Titman 1993) and MG (Moskowitz and Grinblatt 1999) methods and the ratio of closing price to previous 3, 6, 9 or 12 months high (price ratio) by GH (George and Hwang 2004) methods into 3, 5 or 10 groups. Winners are groups with the highest return or price ratio, medium return are groups with medium return or price ratio and losers are groups with the lowest return or price ratio. In each of the winner, medium or loser groups we

again sort the stocks into 3, 5 or 10 groups by market capitalization (stocks with largest market capitalization are called large capitalization groups, medium market capitalization medium cap and smallest market capitalization small cap). 1) Loser/large capitalization are the groups of stocks with loser return or price ratio and largest market capitalization and 2) the group of stocks 1 This is why the sorting has to end in December 2002 because we only have CRSP data until December 2007. 4 with loser return or price ratio and medium market capitalization are called the loser/medium capitalization groups. Likewise, 3) loser/small capitalization groups are stocks with loser return or price ratio and smallest market capitalization, 4) medium/large

capitalization are those with medium return or price ratio and largest capitalization, 5) medium –small capitalization are those with medium return or price ratio and smallest capitalization, 6) winner/large capitalization are those with winner return or price ratio and largest capitalization, 7) winner/medium capitalization are those with winner return or price ratio and medium capitalization and 8) winner/small capitalization are those with winner return or price ratio and smallest capitalization. The monthly return of the above 8 combination groups at the end of next 3 – 12 months and 18 - 60 months are then calculated by the JT approach. The difference of return between two combination groups is reported below.

Methods	No of return groups	No of market cap groups	Length of sort periods	Difference of monthly return at end of next											
				3	6	9	12	18	24	30	36	42	48	54	60
months															
<b>Panel A First sorted into 10 return groups and then into 3 market capitalization groups</b>															
JT	10	3	3	-0.0198	-0.0122	-0.0096	-0.0078	-0.0089	-0.0079	-0.0078	-0.0070	-0.0065	-0.0059	-0.0055	-0.0051
JT	10	3	t-stat	-6.45**	-4.62**	-4.09**	-4.05**	-5.50**	-5.64**	-6.10**	-6.04**	-6.11**	-5.91**	-5.81**	-5.75**
JT	10	3	6	-0.0158	-0.0110	-0.0090	-0.0093	-0.0107	-0.0099	-0.0096	-0.0088	-0.0082	-0.0074	-0.0070	-0.0065
JT	10	3	t-stat	-4.36**	-3.40**	-3.29**	-3.88**	-5.27**	-5.45**	-5.88**	-5.93**	-6.02**	-5.78**	-5.81**	-5.76**
JT	10	3	9	-0.0144	-0.0101	-0.0104	-0.0112	-0.0119	-0.0115	-0.0109	-0.0101	-0.0095	-0.0087	-0.0081	-0.0076
JT	10	3	t-stat	-3.77**	-3.13**	-3.63**	-4.33**	-5.33**	-5.66**	-5.96**	-6.05**	-6.07**	-5.97**	-5.96**	-5.99**
JT	10	3	12	-0.0141	-0.0125	-0.0128	-0.0134	-0.0137	-0.0131	-0.0122	-0.0115	-0.0107	-0.0098	-0.0091	-0.0086
JT	10	3	t-stat	-3.89**	-3.84**	-4.33**	-4.95**	-5.67**	-6.04**	-6.29**	-6.38**	-6.29**	-6.16**	-6.16**	-6.18**
GH	10	3	3	-0.0191	-0.0134	-0.0112	-0.0099	-0.0100	-0.0092	-0.0086	-0.0079	-0.0075	-0.0068	-0.0063	-0.0058
GH	10	3	t-stat	-5.13**	-3.87**	-3.43**	-3.30**	-3.70**	-3.69**	-3.67**	-3.57**	-3.53**	-3.36**	-3.26**	-3.11**
GH	10	3	6	-0.0175	-0.0127	-0.0109	-0.0102	-0.0111	-0.0105	-0.0101	-0.0092	-0.0087	-0.0079	-0.0074	-0.0069
GH	10	3	t-stat	-4.22**	-3.25**	-3.02**	-3.06**	-3.67**	-3.75**	-3.84**	-3.73**	-3.67**	-3.53**	-3.46**	-3.33**
GH	10	3	9	-0.0160	-0.0117	-0.0105	-0.0105	-0.0117	-0.0113	-0.0109	-0.0100	-0.0095	-0.0086	-0.0081	-0.0076
GH	10	3	t-stat	-3.65**	-2.89**	-2.82**	-3.05**	-3.75**	-3.88**	-3.99**	-3.89**	-3.84**	-3.67**	-3.63**	-3.53**
GH	10	3	12	-0.0147	-0.0112	-0.0107	-0.0108	-0.0122	-0.0118	-0.0113	-0.0105	-0.0098	-0.0089	-0.0085	-0.0080
GH	10	3	t-stat	-3.36**	-2.79**	-2.86**	-3.13**	-3.84**	-4.04**	-4.12**	-4.02**	-3.94**	-3.77**	-3.73**	-3.67**
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<b>Panel B First sorted into 5 return groups and then into 5 market capitalization groups</b>															
JT	5	5	3	-0.0187	-0.0122	-0.0099	-0.0082	-0.0086	-0.0075	-0.0071	-0.0062	-0.0059	-0.0053	-0.0050	-0.0047
JT	5	5	t-stat	-7.11**	-5.45**	-4.93**	-5.01**	-6.21**	-6.14**	-6.46**	-6.22**	-6.31**	-6.15**	-6.15**	-6.14**
JT	5	5	6	-0.0156	-0.0113	-0.0092	-0.0092	-0.0101	-0.0090	-0.0086	-0.0077	-0.0073	-0.0066	-0.0062	-0.0058
JT	5	5	t-stat	-5.13**	-4.17**	-4.05**	-4.59**	-5.85**	-5.91**	-6.19**	-6.07**	-6.15**	-5.95**	-5.98**	-5.91**
JT	5	5	9	-0.0149	-0.0110	-0.0107	-0.0111	-0.0113	-0.0105	-0.0098	-0.0091	-0.0086	-0.0078	-0.0072	-0.0067
JT	5	5	t-stat	-4.68**	-4.05**	-4.43**	-5.07**	-5.94**	-6.15**	-6.30**	-6.29**	-6.34**	-6.14**	-6.09**	-6.02**
JT	5	5	12	-0.0137	-0.0125	-0.0124	-0.0127	-0.0125	-0.0118	-0.0108	-0.0102	-0.0095	-0.0086	-0.0079	-0.0076
JT	5	5	t-stat	-4.47**	-4.55**	-4.98**	-5.56**	-6.20**	-6.45**	-6.53**	-6.58**	-6.55**	-6.34**	-6.30**	-6.34**
GH	5	5	3	-0.0201	-0.0152	-0.0134	-0.0120	-0.0113	-0.0104	-0.0095	-0.0088	-0.0082	-0.0075	-0.0070	-0.0065
GH	5	5	t-stat	-6.15**	-5.00**	-4.66**	-4.51**	-4.67**	-4.65**	-4.56**	-4.40**	-4.28**	-4.13**	-3.98**	-3.83**
GH	5	5	6	-0.0192	-0.0150	-0.0134	-0.0125	-0.0125	-0.0117	-0.0109	-0.0101	-0.0095	-0.0087	-0.0081	-0.0075
GH	5	5	t-stat	-5.36**	-4.48**	-4.27**	-4.32**	-4.74**	-4.76**	-4.74**	-4.59**	-4.52**	-4.31**	-4.19**	-4.04**
GH	5	5	9	-0.0176	-0.0143	-0.0129	-0.0125	-0.0129	-0.0122	-0.0116	-0.0107	-0.0101	-0.0092	-0.0086	-0.0080
GH	5	5	t-stat	-4.75**	-4.13**	-4.01**	-4.19**	-4.75**	-4.81**	-4.86**	-4.71**	-4.64**	-4.42**	-4.30**	-4.18**
GH	5	5	12	-0.0167	-0.0141	-0.0131	-0.0128	-0.0130	-0.0125	-0.0120	-0.0112	-0.0106	-0.0096	-0.0090	-0.0084
GH	5	5	t-stat	-4.50**	-4.03**	-4.02**	-4.21**	-4.72**	-4.86**	-4.92**	-4.80**	-4.73**	-4.53**	-4.41**	-4.29**
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Panel C First sorted into 3 return groups and then into 10 market capitalization groups

JT	3	10	3	-0.0200	-0.0142	-0.0117	-0.0094	-0.0090	-0.0077	-0.0070	-0.0061	-0.0058	-0.0052	-0.0047	-0.0044
JT	3	10	t-stat	-8.50**	-7.02**	-6.50**	-6.36**	-7.20**	-7.04**	-7.04**	-6.67**	-6.71**	-6.43**	-6.23**	-6.15**
JT	3	10	6	-0.0191	-0.0143	-0.0117	-0.0109	-0.0106	-0.0091	-0.0084	-0.0075	-0.0071	-0.0064	-0.0059	-0.0055
JT	3	10	t-stat	-6.68**	-5.66**	-5.53**	-5.86**	-6.74**	-6.63**	-6.68**	-6.42**	-6.47**	-6.21**	-6.04**	-5.90**
JT	3	10	9	-0.0181	-0.0136	-0.0125	-0.0122	-0.0116	-0.0103	-0.0094	-0.0087	-0.0081	-0.0073	-0.0067	-0.0063
JT	3	10	t-stat	-6.06**	-5.34**	-5.50**	-5.95**	-6.50**	-6.50**	-6.52**	-6.42**	-6.40**	-6.19**	-5.99**	-5.92**
JT	3	10	12	-0.0176	-0.0152	-0.0144	-0.0140	-0.0128	-0.0115	-0.0104	-0.0097	-0.0090	-0.0082	-0.0075	-0.0071
JT	3	10	t-stat	-6.10**	-5.86**	-6.04**	-6.46**	-6.70**	-6.74**	-6.67**	-6.60**	-6.58**	-6.37**	-6.15**	-6.14**
GH	3	10	3	-0.0232	-0.0182	-0.0158	-0.0141	-0.0128	-0.0115	-0.0103	-0.0093	-0.0087	-0.0080	-0.0074	-0.0069
GH	3	10	t-stat	-7.76**	-6.52**	-5.98**	-5.76**	-5.85**	-5.73**	-5.46**	-5.22**	-5.09**	-4.87**	-4.64**	-4.49**
GH	3	10	6	-0.0228	-0.0182	-0.0163	-0.0149	-0.0141	-0.0127	-0.0116	-0.0106	-0.0100	-0.0092	-0.0084	-0.0079
GH	3	10	t-stat	-6.89**	-5.95**	-5.66**	-5.67**	-5.96**	-5.82**	-5.66**	-5.41**	-5.32**	-5.10**	-4.85**	-4.75**
GH	3	10	9	-0.0212	-0.0177	-0.0161	-0.0152	-0.0144	-0.0131	-0.0123	-0.0114	-0.0107	-0.0097	-0.0090	-0.0085
GH	3	10	t-stat	-6.25**	-5.59**	-5.43**	-5.57**	-5.90**	-5.82**	-5.77**	-5.55**	-5.45**	-5.17**	-4.96**	-4.85**
GH	3	10	12	-0.0208	-0.0176	-0.0164	-0.0158	-0.0150	-0.0136	-0.0127	-0.0118	-0.0110	-0.0100	-0.0093	-0.0087
GH	3	10	t-stat	-6.01**	-5.49**	-5.42**	-5.67**	-5.99**	-5.88**	-5.85**	-5.64**	-5.51**	-5.27**	-5.06**	-4.95**

\* denotes t-statistics significant at 10% and \*\* significant at 5% respectively

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