



## A Columbine White Paper: The January Effect Revisited

February 10, 2010

### SUMMARY

- By utilizing the Fama-French momentum data set we were able to extend our earlier studies of the January effect back an additional forty years.
- On an equal-weighted return basis US markets are more likely to experience a positive return in January than in other months.
- On a capitalization-weighted basis the January performance effect is much weaker.
- Small-cap stocks do tend to outperform big-cap stocks in January.
- January market performance is positively correlated with the market's return for the remainder of the year, but the relationship is weak.
- Stocks displaying a strong price trend over the previous year tend to reverse course in January.
- In small-cap stocks the January price trend reversal is symmetrical, with both winners and losers changing direction in January.
- In large-cap stocks the January trend reversal is mainly observed in loser stocks that have declined over the past year.
- The prior year's market performance is positively correlated with price momentum spread in January, but the relationship is not strong enough to yield useful forecasts.
- Our attempt to predict the January reversal based on prior-year market direction has not been a success—we are abandoning our annual forecasts.
- The best assumption for January is that price momentum will reverse, especially in small-cap stocks.
- Avoid using price momentum to make changes in portfolios from mid-December through mid-January.

## INTRODUCTION

In November of 2001, Columbine Capital published a white paper report on the “January effect” in equity markets. In that paper we examined the evidence supporting the various versions of the January effect and also announced a predictor of one aspect of the effect, the reversal of the returns to price momentum measures often experienced in Januarys. Since that announcement we have been using that predictor at the end of each year to forecast whether or not the Columbine Alpha price momentum factor will work normally or be reversed in the coming month of January. Over the following nine years that predictor has been wrong more often than it has been right.

With this report we re-examine the findings of our earlier work using a longer data set of price momentum returns. Drawing on that longer history we reconfirm the existence of the various forms of the January effect and reconsider the rationale behind our January price momentum reversal predictor.

## DATA SET

For this study we used the return series developed by Eugene Fama and Kenneth French and available on French’s web site.<sup>1</sup> Their data extend back to 1926 drawing on the CRSP returns, and in more recent years include all NYSE, AMEX, and NASDAQ stocks that have the requisite prices available to compute monthly returns. Their universe count ranges from a low of 464 issues at the beginning of the data set to over 6,500 in the late 90s. The Fama-French momentum portfolios we analyzed are based on a simple measure of stock return over the past year, from month  $t-12$  to month  $t-2$ . Those stocks with the highest returns for the period are ranked as having high positive momentum (*top decile* in our usage) and those with the lowest returns are ranked as having low or negative momentum (*bottom decile*). This metric is based on the same concept as an eleven-month relative strength measure—one of the best simple price momentum approaches we have tested.

While our Columbine Alpha Factor’s more sophisticated methodology generates better risk-adjusted returns than the Fama-French momentum model, at bottom it still is based on the return of a given stock over the past twelve months. Over the period of years for which we have returns from both measures, the monthly top decile returns from the Fama-French momentum measure and Columbine Alpha are positively correlated at 0.93. We feel confident that for the purpose of studying the January effect the Fama-French momentum model can serve as a perfectly good proxy for the Columbine Alpha Factor. Additionally, this data set is publically available (so our work can be verified), is not something that we created (so it cannot be the product of our data mining), and represents a very basic version of momentum that has been produced over a long period of time with no attempt to fix it when it fails to work for awhile.

## THE JANUARY EFFECTS

A quick Web search on the term “January effect” will turn up lots of hits, but no hard and fast agreement about what exactly that term means. The January scenarios described by different analysts vary, but the common theme is that there is some form of abnormal

market behavior centered on the end of the calendar year and the first month of the New Year. Our review of the literature reveals that there are at least four variants in common circulation: a *performance* effect, a *capitalization* effect, a *predictor* effect, and a *reversal* effect. An examination of each effect individually leads to the conclusion that, with the exception of the predictor effect, all of the variations are inter-related.

### Performance Effect

Probably the version of the January effect that's been around the longest is the idea that US stocks rise much more in January than in any other month of the year. Sidney Wachtel<sup>2</sup> discovered the phenomenon in the 1940s, but it wasn't until the 1970s that anybody took much notice. Later researchers confirmed that over long periods of years the average stock market return during the month of January was several times the average market return for a typical non-January month.<sup>3</sup> In the Fama-French data the average non-January month's universe return is 0.91%, (equal-weighted) compared with an average January return of 5.70%. See **Table 1**. The next nearest competitor is July with an average return of 1.65%.

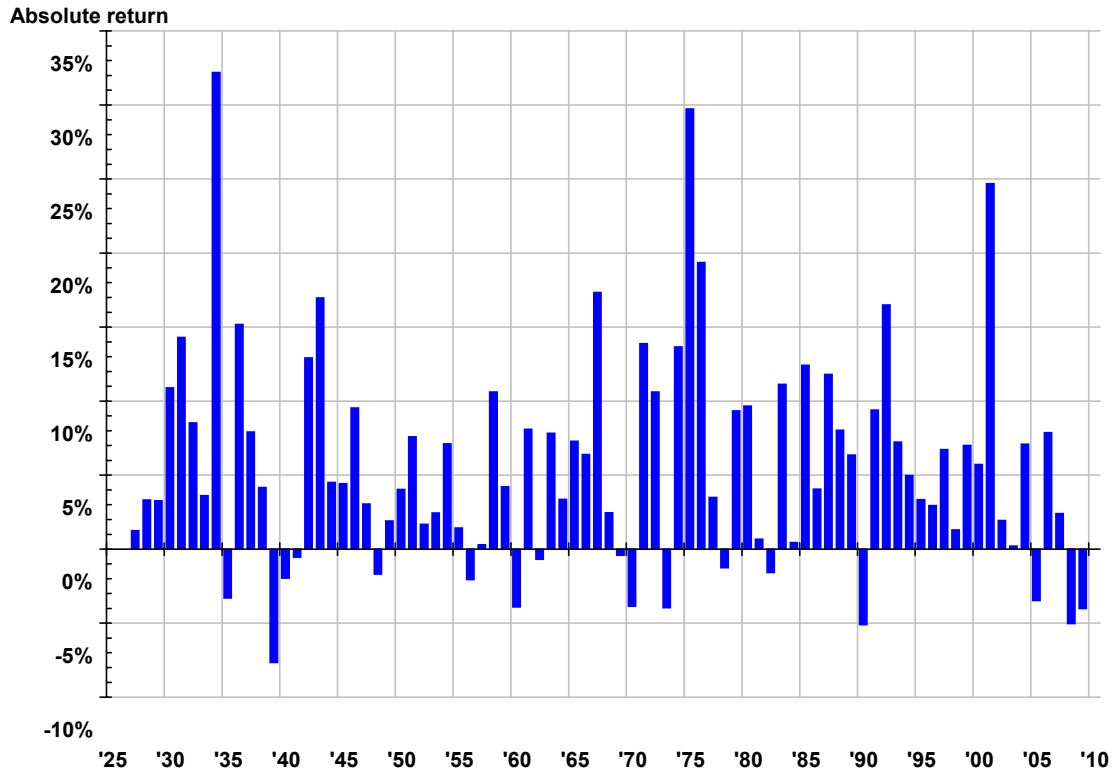
Not only is the average return higher, but the number of up-market Januarys is considerably greater than during the months of the rest of the year. Over the years 1927 through 2009 covered in the Fama-French data, the universe's hit rate (percentage of positive return months) for January is about 80% compared to only about 60% in the other eleven months. **Figure 1** illustrates the market return in January for each year in the study. Down-market Januarys show up only seventeen times in the entire sample, and even those tend to be of much smaller magnitude compared with the positive return Januarys; the worst loss ever is less than 10%, but the highest January positives top out over 30%. Despite the fact that this phenomenon has been commented on for decades, the year-to-year history of the effect looks very stable.

**Table 1. Monthly universe returns: 1927-2009**

	Equal-Weighted			Capitalization-Weighted		
	All	Non-Jan	Jan	All	Non-Jan	Jan
<b>Mean Return</b>	1.31%	0.91%	5.70%	0.92%	0.87%	1.47%
<b>Standard Deviation</b>	7.53%	7.42%	7.40%	5.38%	5.44%	4.71%
<b>Standard Error</b>	0.24%	0.25%	0.81%	0.17%	0.18%	0.52%
<b>t-stat</b>	5.47	3.69	7.02	5.39	4.83	2.83
<b>Hit Rate (r&gt;0)</b>	61.3%	59.7%	79.5%	62.0%	61.8%	65.1%

### Small-Cap Effect

Of course making this analysis on a simple equal-weighted average gives small companies greater relative influence than would be true on a value-weighted index where large companies dominate. This leads directly to the second form of the January effect, that small-cap stocks outperform big-cap stocks in January. Research in the early 80s confirmed that the performance version of the January effect is primarily a small-cap phenomenon.<sup>4</sup> The results in the Fama-French data set confirm this. When returns for the universe are computed on a capitalization-weighted basis (see **Table 1**) the January average return drops from 5.70% to 1.47%. That is still greater than the non-January average of 0.87%, but by a much smaller margin than that in the equal-weighted set. In fact, on a cap-weighted basis both July and December have higher average returns than

**Figure 1. January market returns**

January (1.49% and 1.70% respectively). Further, the January hit rate (percentage of months with a positive market return) drops from 80% to 65% when we analyze the returns on a cap-weighted basis. That's better than the non-January hit rate, but only by a little more than 3%. On the value-weighted metric December becomes the most consistent up-market month with a hit rate greater than 80%. See **Appendix I**.

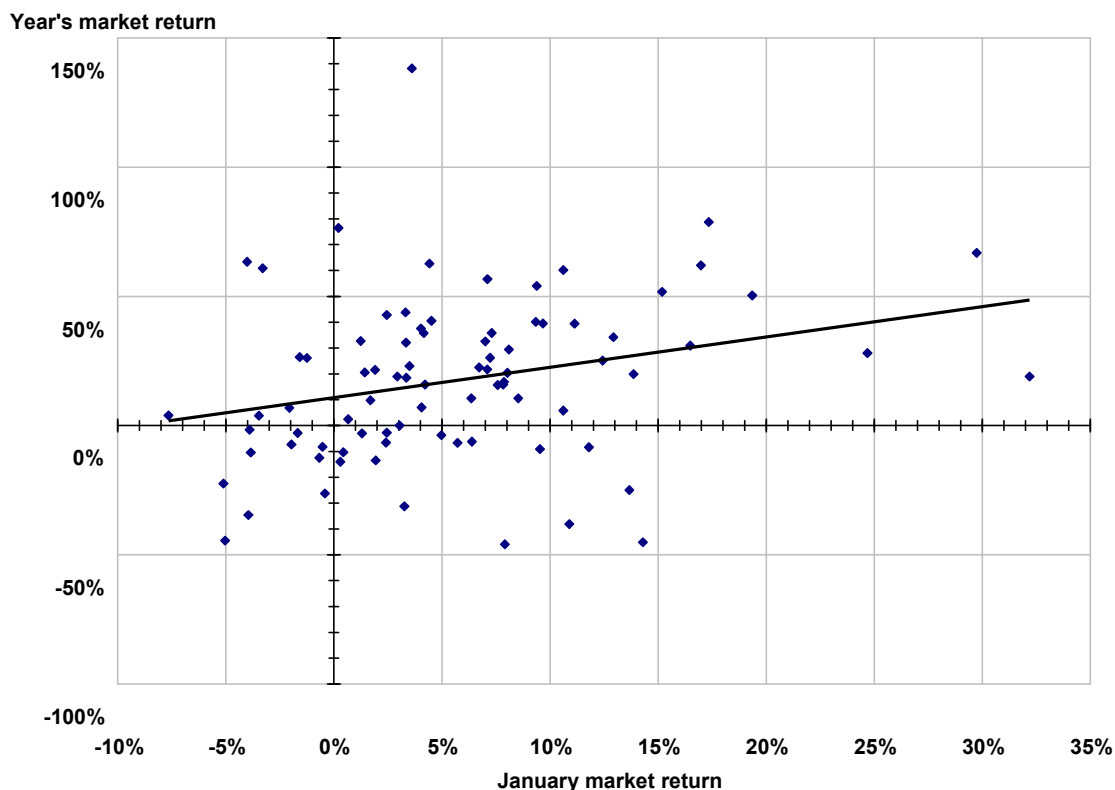
Looking at the universe returns for the smallest capitalization quintile of the Fama-French data set versus the largest capitalization quintile makes the existence of the small-cap effect crystal clear. For the largest cap quintile stocks the equal-weighted average universe return in January is higher than for the non-January months, but only by 64 basis points (1.51% vs. 0.87%). See **Table 2**. In the smallest cap quintile stocks, however, the average January universe return is 9.95%, while the non-January average is only 1.04%. In other words, in the smallest capitalization stocks the average January return is almost ten times higher than in the rest of the months, but in the largest capitalization names January returns are only a bit less than two times higher. The smallest capitalization quintile also is considerably more likely to experience a positive return in January than is the largest cap quintile (hit rate of 86.7% vs. 66.3%). Finally, the smallest cap quintile outperforms the largest cap quintile universe in 94% of the Januaries compared with less than 50% of the time in the other months. Clearly, small-cap stocks are the main driver of the performance version of the January effect.

**Table 2. Monthly universe returns by capitalization quintile: 1927-2009**

	Smallest Cap Quintile			Largest Cap Quintile		
	All	Non-Jan	Jan	All	Non-Jan	Jan
<b>Mean Return</b>	1.78%	1.04%	9.95%	0.93%	0.87%	1.51%
<b>Standard Deviation</b>	10.38%	9.99%	11.08%	5.68%	5.75%	4.77%
<b>Standard Error</b>	0.33%	0.33%	1.22%	0.18%	0.19%	0.52%
<b>t-stat</b>	5.41	3.27	28.31	5.15	4.79	9.99
<b>Hit Rate (r&gt;0)</b>	59.6%	57.1%	86.7%	61.2%	60.8%	66.3%

### Predictor Effect

There is one final market-return version of the January effect that deserves mention. That is the idea that as January goes, so goes the market for the rest of the year. If we have an up-market January, then the rule says market will have an up year. There is some modest statistical basis for this. **Figure 2** illustrates the relationship between the market return of January and the market return for the following full calendar year.

**Figure 2. January market vs. same year's market: 1927–2009**

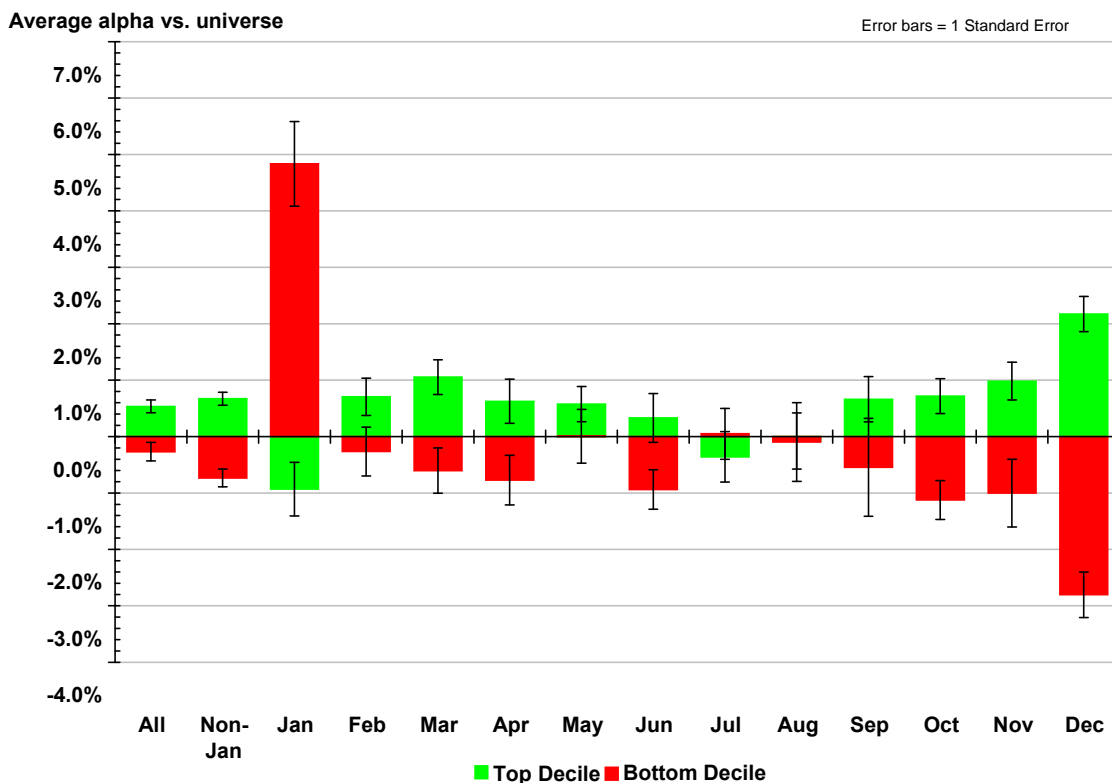
As the trendline in the figure indicates, there is a positive correlation between the market return in January and the return for the entire year, but it is not strong enough to be terribly convincing—the r-squared is only 0.07. It may simply be that since stocks generally have a positive return bias in most years (69% of the years in this 83-year data

set), and Januarys are up-market months nearly 80% of the time, this theory owes its currency to pure coincidence.

### Reversal effect

The aspect of the January effect that is of most interest to us as modelers of price momentum is the observation that stocks that have displayed a strong price trend over the past year tend to reverse course in January and then re-establish their trend later in the year. Since virtually every medium-term measure of price momentum, including our Columbine Alpha Factor is a trend-following measure, this January reversal phenomenon has to be a concern since it flies in the face of typical price behavior during the rest of the year.<sup>5</sup>

**Figure 3. F-F momentum — alpha by calendar month: 1927–2009**



**Figure 3** illustrates the basic form of the effect. The chart reports the average alpha (active return versus the universe) from the top and bottom deciles of the Fama-French momentum measure for each calendar month across the period 1927 through 2009 in all stocks in their universe. These results are based on equal-weighted returns, so the small-cap effect is at work here, but the overall picture is quite clear: average returns to price momentum are perverse in January by a large degree. The top decile (stocks with the largest positive returns from month  $t-12$  to month  $t-2$ ) underperforms by 0.93% on average, while the bottom decile (stocks that have the largest negative returns from month  $t-12$  to month  $t-2$ ) outperforms by 4.83%. See **Table 3**. This result is consistent with the most commonly reported form of the January reversal—that stocks that have declined a lot in the past year will rise in January. Both strong and weak stocks reverse their trend in January, but the effect appears much more pronounced with the weak

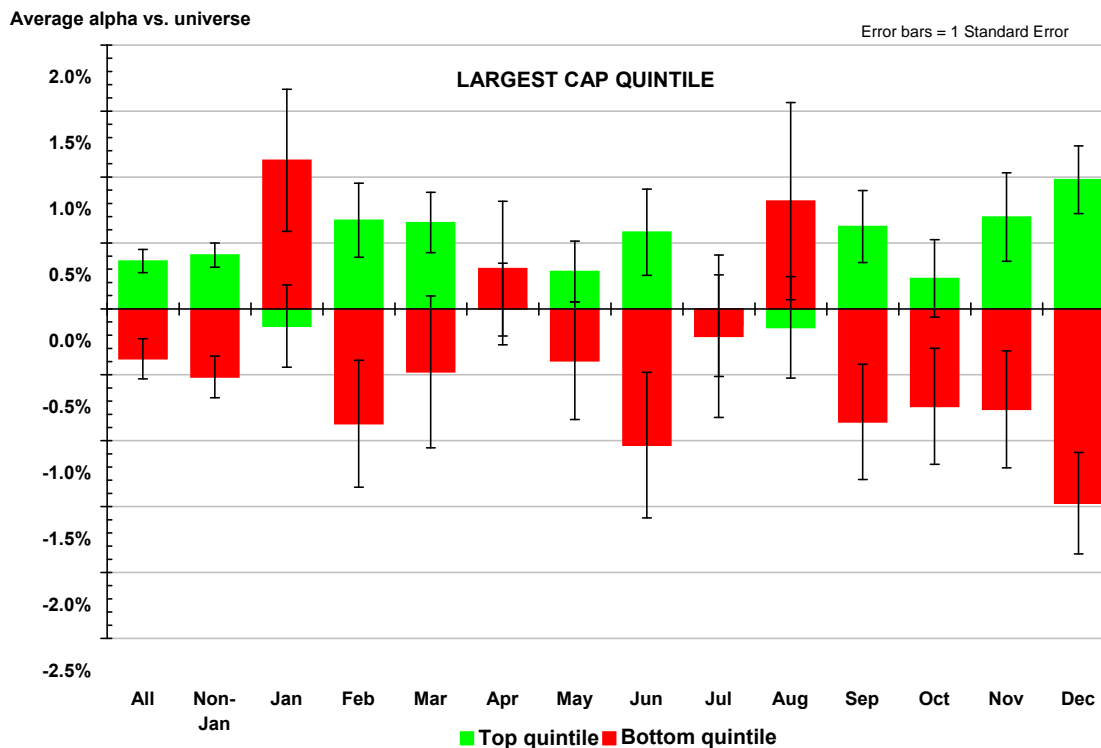
ones. The hit rate for the top decile is 41%, meaning that top decile stocks outperform the universe on average in 41% of the Januarys, but the bottom decile's hit rate is 22.9%, so the bottom decile stocks only properly underperform in fewer than 23% of the Januarys.

**Table 3. Monthly alpha — F-F momentum deciles of all stocks: 1927–2009**

	Top Decile			Bottom Decile		
	All	Non-Jan	Jan	All	Non-Jan	Jan
Mean Alpha	0.54%	0.67%	-0.93%	-0.27%	-0.73%	4.83%
Standard Deviation	3.56%	3.46%	4.33%	5.20%	4.77%	6.83%
Standard Error	0.11%	0.11%	0.48%	0.17%	0.16%	0.75%
t-stat	4.74	5.85	-1.96	-1.62	-4.64	6.45
Hit Rate ( $\alpha > 0$ , $\alpha < 0$ )	63.4%	65.5%	41.0%	66.7%	70.7%	22.9%

We can see the additional impact of capitalization on the January reversal effect in **Figures 4** and **5**. These charts present the same monthly average information, but instead of deciles of the entire universe, we see the results for the intersections of quintiles of market capitalization and quintiles of the Fama-French momentum measure. **Figure 4** shows results in the largest cap quintile, and **Figure 5** shows the smallest cap quintile returns. In the biggest capitalization stocks the January reversal effect is attenuated compared to the overall results, but it is still present. It is most obvious among the weak (bottom decile) stocks, with the top decile's strong performers only

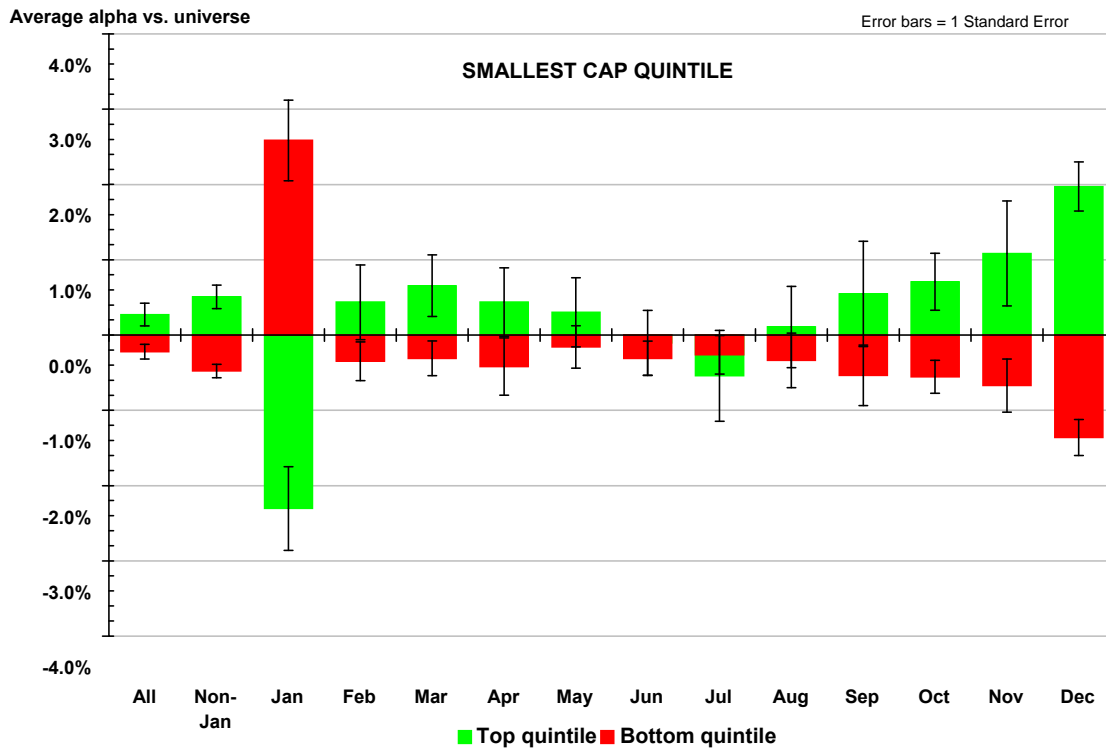
**Figure 4. F-F momentum — large-cap alpha by calendar month: 1927–2009**



generating a modest negative result. This big-cap phenomenon is probably the source of the oft-stated version of the effect which limits its description of January reversals to the rise of stocks which have declined heavily in the prior year.

In **Figure 5**, however, we see that the January reversal is much larger and more symmetrical in the smallest capitalization stocks than in the large cap names. The top quintile of momentum in the smallest quintile of capitalization generates an average January alpha of negative 2.3% and the bottom quintile produces a 2.6% positive alpha on average. Compare those figures with a negative 0.1% and a positive 1.1% respectively in the largest capitalization stocks. See **Table 4**. The monthly hit rates also show that the reversal effect is more frequent in the smaller capitalization stocks. In the largest cap quintile the positive momentum stocks (top quintile) only reverse their performance in January in about 45% of the years, while the weakest performers (bottom quintile) reverse in just under 60% of the Januarys. Among the smallest cap issues, however, strong positive momentum stocks suffer a January reversal about 75% of the time and the bottom quintile's big decliners turn around their performance in more than 80% of the Januarys. Just as with the performance effects, the year-to-year history of these reversal effects shows no sign that they are being arbitrated away despite the widespread publication of the existence of such abnormal January returns.

**Figure 5. F-F momentum — small-cap alpha by calendar month: 1927–2009**



**Table 4. Monthly alpha — F-F momentum quintiles: 1927–2009****Top Momentum Quintile**

	Smallest Cap Quintile			Largest Cap Quintile		
	All	Non-Jan	Jan	All	Non-Jan	Jan
<b>Mean Alpha</b>	0.27%	0.51%	-2.30%	0.36%	0.41%	-0.13%
<b>Standard Deviation</b>	4.78%	4.69%	5.07%	2.79%	2.78%	2.85%
<b>Standard Error</b>	0.15%	0.16%	0.56%	0.09%	0.09%	0.31%
<b>t-stat</b>	1.79	3.41	-14.33	4.10	4.62	-1.45
<b>Hit Rate (<math>\alpha &gt; 0</math>)</b>	61.2%	64.5%	25.3%	60.4%	60.9%	55.4%

**Bottom Momentum Quintile**

	Smallest Cap Quintile			Largest Cap Quintile		
	All	Non-Jan	Jan	All	Non-Jan	Jan
<b>Mean Alpha</b>	-0.22%	-0.48%	2.59%	-0.38%	-0.52%	1.13%
<b>Standard Deviation</b>	3.08%	2.73%	4.89%	4.80%	4.77%	4.91%
<b>Standard Error</b>	0.10%	0.09%	0.54%	0.15%	0.16%	0.54%
<b>t-stat</b>	-2.26	-5.52	16.67	-2.49	-3.41	7.23
<b>Hit Rate (<math>\alpha &lt; 0</math>)</b>	64.2%	68.5%	18.1%	58.3%	60.0%	39.8%

**FORECASTING THE JANUARY REVERSAL EFFECT**

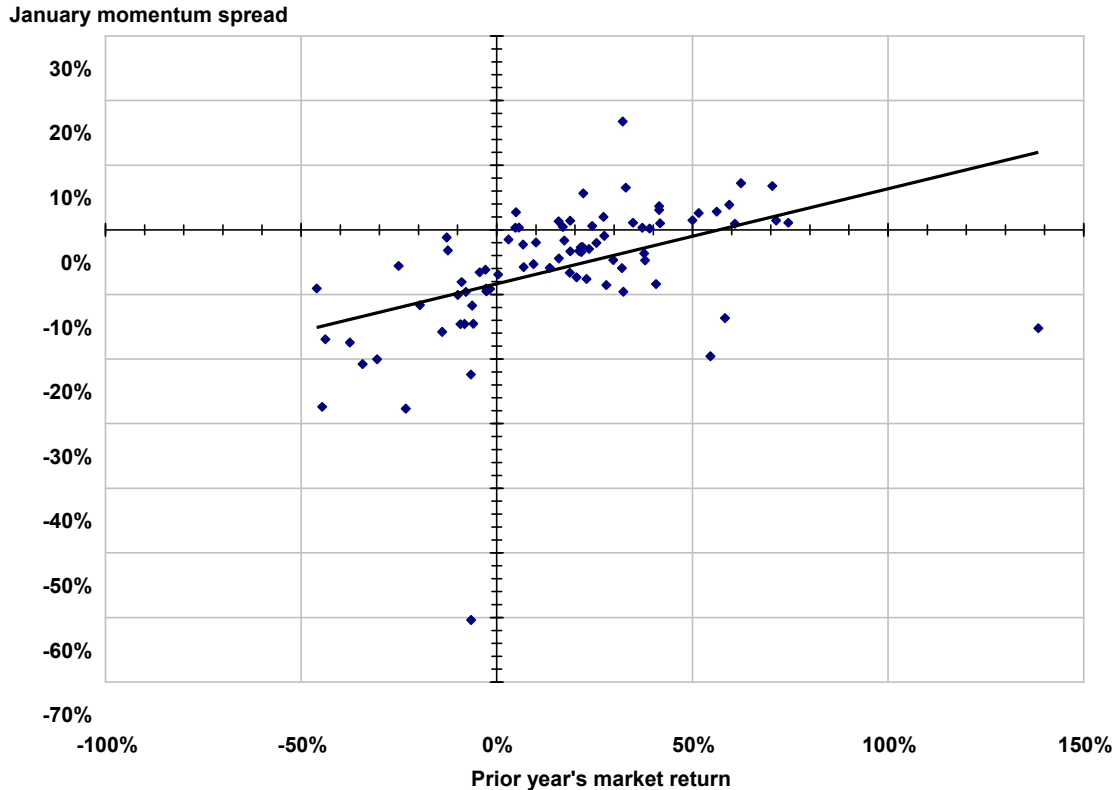
For many years we could advise no more than to avoid the use of price momentum to make changes to portfolios between mid December and mid January. In 2001 we decided to see if we could develop a predictor for the January price momentum reversal effect. We looked at valuation/momentum cycles, a wide range of fundamental factors, economic activity, market direction, and trading volume. Late in the year we came upon an algorithm that offered a chance of predicting at year-end whether or not price momentum would experience a dramatic reversal in the coming January. That algorithm was devised in our database of Columbine Alpha Factor performance over the period 1971–2001. With the Fama-French data set we can extend our examination of this phenomenon back more than four decades further.

The January reversal predictor we have been using since 2001 is driven by the prior year's market direction: if the market as a whole experienced a sufficiently negative return in the calendar year preceding January there is a good likelihood of a January price momentum reversal effect. **Figure 6** illustrates the motivation for our choice. The chart displays the Fama-French momentum measure's January top-bottom decile spread return on the vertical axis and the return of the market for the prior calendar year on the horizontal axis. All of the Fama-French data from 1927 through 2009 are included on this chart, but the picture we saw in 2001 with Columbine Alpha data from 1971-2001 looked very similar.

Clearly there is a positive correlation (0.45) between the past year's market return and the ability of price momentum to generate a positive spread in January of the following year. In fact, there are *no years* where the market declined in the prior year and the Fama-French momentum measure generated a positive top-bottom spread in January. Most of the really big negative spread returns come in years when the market declined

substantially the year before. Unfortunately, there are also a good number of negative spread Januarys present following up-market years. Many of these did not show up in our smaller data set.

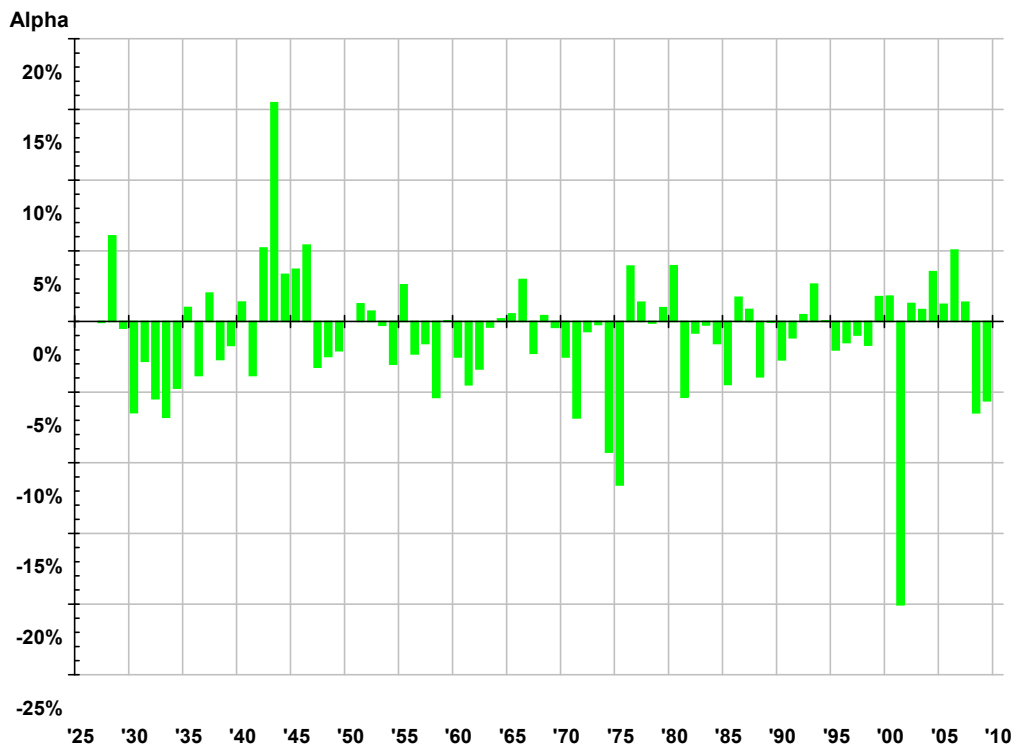
**Figure 6. January F-F momentum spread vs. prior year's market return: 1927–2009**



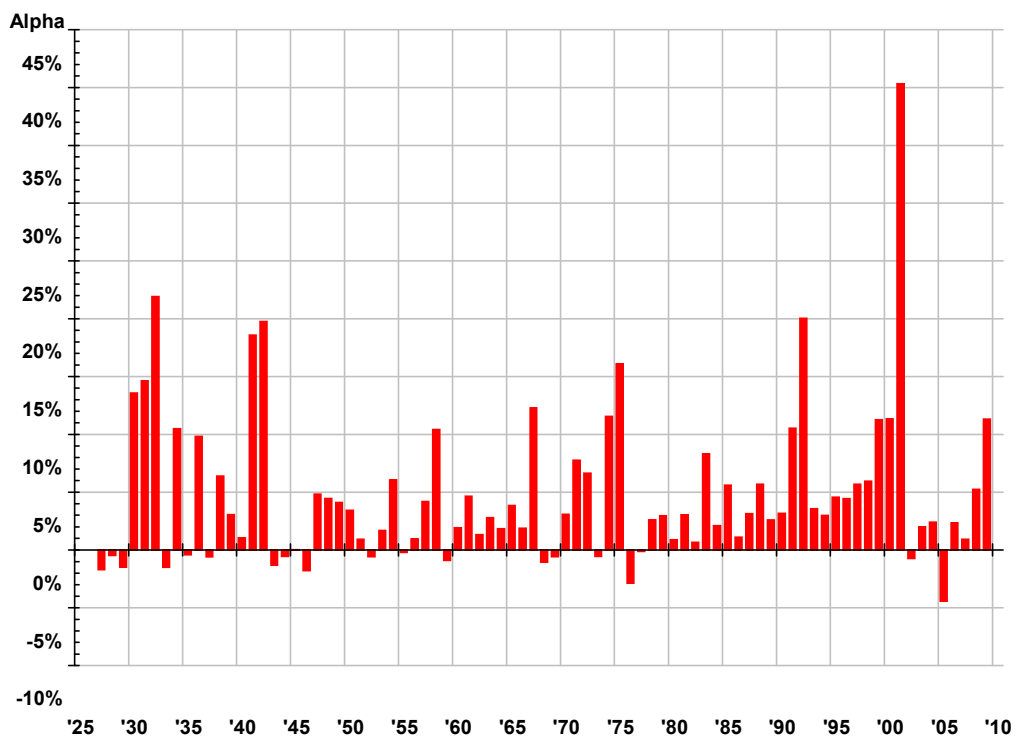
The correlation between prior year market direction and January price momentum is not really the salient point in this chart. Covering up everything below the horizontal axis reveals the important lesson—over more than eight decades of history there simply are damn few years when price momentum generated a positive top-bottom decile spread in January. And when it did, it usually was not a very big positive. While strong performing stocks in the top decile of momentum have at least a modest chance of working properly in January (see **Figure 7**), weak performing bottom decile momentum stocks rarely underperform properly in January, and then by very little (see **Figure 8**). The result is that even if the top decile does perform correctly, in many years a large reversal of the bottom decile swamps the top decile's positive return, leading to a negative top-bottom spread.

Our more sophisticated Columbine Alpha Factor has a better track record of January performance than the simple Fama-French price momentum measure, but the overwhelming message of this longer-term study is that price momentum reversal in January should be considered the *normal* condition, not an aberration. As a result of this insight, we are discontinuing our attempts to forecast the January reversal effect for price momentum. In the nine years we have been making live January effect forecasts we have made predictions of three substantial January reversals which did not occur, two “no reversal” Januarys which did in fact reverse to some degree, and four good “no

**Figure 7. F-F momentum — annual January top decile alpha**



**Figure 8. F-F momentum — annual January bottom decile alpha**



reversal” calls. These results sound like the old saw about the stock market predicting nine out of the past five recessions.

Effective this year we will return to our former policy of zero-weighting Columbine Alpha price momentum in all of our US multifactor models from mid-December through mid-January. Our basic advice to users of the Columbine Alpha Factor, or any other form of price momentum, will be to avoid using the measure to make changes in position in portfolios during that same period. However, as a result of this more extensive study we can add some nuance to that policy that we were ignorant of earlier:

1. For long-only managers running a portfolio of large-cap names, the January effect is unlikely to be a major concern in any year. Your principal risk in using price momentum at year-end is one of opportunity cost, in that the weak names you would avoid are likely to outperform in the short run during January.
2. Short-only or long-short managers of large-cap portfolios who want to make use of price momentum in the normal way over the year-end should restrict themselves to Januarys following up-market years. That strategy does improve the odds of avoiding a major price momentum reversal of weak stocks, but does not eliminate the risk.
3. If you are a small-cap manager running any strategy on either the long or short sides, do not use trend-following price momentum during the year-end period no matter what the prior year’s market has done.
4. If you want to try to exploit the January effect as a trading strategy, go long in small-cap names that have dramatically declined in price in the prior year. That is the most consistently successful application of the January reversal effect, though limited by a short holding period of one month or less.

## **WHAT CAUSES IT?**

Several different causes have been posited for the existence of the January effect in its various forms:

- End of the year “window dressing” by professional investors who want to eliminate any embarrassing losers from their portfolio prior to the end of the year, the most important reporting period of the year
- Tax-loss harvesting by investors in stocks that have declined in price
- January investment of end-of-year cash infusions such as bonuses or proceeds from the sales of large-cap stocks on which long-term capital gains are being realized
- The postponing of the sale of stocks that experienced capital gains until after the New Year

The bulk of the evidence suggests that individuals, rather than institutional investors, are the major sellers around year-end. That would be consistent with our observation that

the effects are more pronounced in small-cap stocks. The continued presence of a January effect since the passage of the Tax Reform Act of 1986 suggests that institutions are not the primary source of the effect. The Act's requirement that mutual funds distribute at least 98% of realized capital gains by October 31<sup>st</sup> each year means that any institutional tax-motivated selling should occur well before the end of the calendar year.<sup>6</sup>

Whatever the underlying causes of the January effect, it continues to make life difficult for portfolio managers. We have decided to accept the inevitable and learn to live with it rather than trying to fight it.

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## NOTES

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<sup>1</sup> Fama is the Robert R. McCormick Distinguished Service Professor of Finance at the University of Chicago Booth School of Business, and French is the Carl E. and Catherine M. Heidt Professor of Finance at the Tuck School of Business, Dartmouth College. They make their data available for others to study: [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)

<sup>2</sup> Wachtel, Sidney B. 1942. *Certain Observations on Seasonal Movements in Stock Prices*. Chicago: The University of Chicago Press.

<sup>3</sup> For an extensive review and update on calendar anomalies in general, see Keim, Donald B., and William T. Ziemba, eds. 2000. *Security Market Imperfections in Worldwide Equity Markets*. New York: Cambridge University Press.

<sup>4</sup> Reinganum, Marc R. 1983. "The Anomalous Stock Market Behavior of Small Firms in January: Empirical Tests for Tax-Loss Selling Effects." *Journal of Financial Economics*, vol. 12 (June):89–104.

<sup>5</sup> We believe we were among the first to document this January price reversal effect and the potential portfolio benefit that accrues from avoiding price momentum at year-end. See Brush, John S. 1986. "Eight Relative Strength Models Compared." *Journal of Portfolio Management*, vol. 13, no. 1 (Fall):21–28.

<sup>6</sup> For an excellent review of the evidence supporting the different theories on the causes of the January effect see Haug, Mark, and Mark Hirschey. 2006. "The January Effect." *Financial Analysts Journal*, vol. 62, no. 5 (September/October):78–88.



## Appendix I -- F-F Momentum Model -- Average Absolute Return by Calendar Month

### All Stocks Universe: 1927-2009 -- Equal Weighting

#### TOP DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	1.84%	1.58%	4.77%	1.95%	1.91%	2.08%	1.67%	1.21%	1.30%	1.49%	0.13%	0.14%	2.27%	3.23%
<b>Standard Deviation</b>	7.47%	7.38%	7.88%	6.23%	6.37%	8.39%	9.60%	6.53%	6.79%	6.78%	7.32%	8.91%	7.78%	5.21%
<b>Standard Error</b>	0.24%	0.24%	0.86%	0.68%	0.70%	0.92%	1.05%	0.72%	0.75%	0.74%	0.80%	0.98%	0.86%	0.58%
<b>t-stat</b>	7.78	6.45	5.52	2.86	2.73	2.26	1.58	1.69	1.74	2.00	0.16	0.14	2.65	5.61
<b>Sharpe Ratio</b>	0.86	0.74	2.10	1.09	1.04	0.86	0.60	0.64	0.66	0.76	0.06	0.05	1.01	2.15
<b>Best</b>	56.60%	56.60%	32.44%	31.49%	14.12%	44.75%	56.60%	22.36%	15.61%	30.82%	15.08%	17.29%	19.17%	20.99%
<b>Worst</b>	-32.31%	-32.31%	-11.50%	-11.60%	-22.36%	-18.48%	-30.15%	-20.81%	-17.85%	-22.07%	-25.86%	-32.31%	-19.13%	-9.41%
<b>Hit Rate (r&gt;0)</b>	64.6%	64.0%	71.1%	63.9%	69.9%	66.3%	66.3%	60.2%	60.2%	59.0%	57.8%	57.3%	67.1%	75.6%

#### BOTTOM DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	1.04%	0.17%	10.54%	0.98%	0.25%	0.68%	1.10%	-0.06%	1.70%	1.47%	-1.08%	-1.71%	0.29%	-1.75%
<b>Standard Deviation</b>	11.41%	10.92%	12.38%	8.33%	8.87%	11.20%	12.41%	9.20%	10.96%	14.44%	14.65%	8.78%	10.79%	7.83%
<b>Standard Error</b>	0.36%	0.36%	1.36%	0.91%	0.97%	1.23%	1.36%	1.01%	1.20%	1.59%	1.61%	0.97%	1.19%	0.86%
<b>t-stat</b>	2.87	0.48	7.76	1.08	0.26	0.55	0.81	-0.06	1.41	0.93	-0.67	-1.76	0.24	-2.02
<b>Sharpe Ratio</b>	0.32	0.06	2.95	0.41	0.10	0.21	0.31	-0.02	0.54	0.35	-0.26	-0.67	0.09	-0.77
<b>Best</b>	-39.00%	-39.00%	-7.89%	-18.66%	-39.00%	-22.98%	-25.84%	-23.92%	-22.80%	-24.93%	-33.73%	-28.46%	-23.88%	-26.54%
<b>Worst</b>	113.98%	113.98%	65.03%	32.33%	30.18%	57.46%	80.57%	36.99%	69.19%	113.98%	104.78%	21.38%	41.03%	13.65%
<b>Hit Rate (r&lt;0)</b>	46.4%	49.3%	14.5%	42.2%	47.0%	47.0%	45.8%	54.2%	44.6%	45.8%	57.8%	62.2%	46.3%	50.0%

#### UNIVERSE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	1.31%	0.91%	5.70%	1.25%	0.86%	1.45%	1.09%	0.88%	1.65%	1.57%	-0.54%	-0.58%	1.29%	1.06%
<b>Standard Deviation</b>	7.53%	7.42%	7.40%	5.38%	6.28%	8.66%	9.36%	6.84%	7.59%	8.93%	8.07%	7.35%	6.79%	5.06%
<b>Standard Error</b>	0.24%	0.25%	0.81%	0.59%	0.69%	0.95%	1.03%	0.75%	0.83%	0.98%	0.89%	0.81%	0.75%	0.56%
<b>t-stat</b>	5.47	3.69	7.02	2.11	1.24	1.53	1.06	1.17	1.98	1.60	-0.61	-0.72	1.72	1.89
<b>Sharpe Ratio</b>	0.60	0.42	2.67	0.80	0.47	0.58	0.40	0.44	0.75	0.61	-0.23	-0.27	0.66	0.72
<b>Best</b>	66.41%	66.41%	32.19%	15.90%	12.50%	51.77%	60.36%	31.11%	43.47%	66.41%	40.09%	14.31%	14.80%	11.98%
<b>Worst</b>	-31.25%	-31.25%	-7.65%	-15.83%	-28.87%	-18.11%	-26.92%	-18.55%	-18.85%	-20.05%	-31.25%	-27.68%	-18.42%	-18.57%
<b>Hit Rate (r&gt;0)</b>	61.33%	59.7%	79.5%	65.1%	63.9%	62.7%	62.7%	56.6%	61.4%	60.2%	51.8%	48.8%	61.0%	62.2%

Source: 10\_Portfolios\_Prior\_12\_2.txt; 27-Oct-09

## Appendix I -- F-F Momentum Model -- Average Absolute Return by Calendar Month

### All Stocks Universe: 1927-2009 -- Cap Weighting

#### TOP DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	1.52%	1.52%	1.47%	1.40%	1.99%	2.10%	1.09%	1.58%	0.99%	1.41%	-0.16%	0.81%	2.11%	3.42%
<b>Standard Deviation</b>	6.56%	6.56%	6.64%	5.46%	5.96%	6.84%	7.01%	5.55%	6.43%	6.05%	6.78%	8.00%	7.95%	5.17%
<b>Standard Error</b>	0.21%	0.22%	0.73%	0.60%	0.65%	0.75%	0.77%	0.61%	0.71%	0.66%	0.74%	0.88%	0.88%	0.57%
<b>t-stat</b>	7.28	7.00	2.01	2.33	3.05	2.79	1.42	2.60	1.40	2.12	-0.22	0.92	2.40	5.99
<b>Sharpe Ratio</b>	0.80	0.80	0.76	0.89	1.16	1.06	0.54	0.99	0.53	0.81	-0.08	0.35	0.92	2.29
<b>Best</b>	28.58%	28.58%	19.11%	23.02%	12.81%	28.58%	19.28%	17.12%	15.24%	17.18%	10.05%	20.46%	24.78%	21.96%
<b>Worst</b>	-28.64%	-28.64%	-13.33%	-15.92%	-21.18%	-14.64%	-28.64%	-15.92%	-13.34%	-16.85%	-23.05%	-27.59%	-24.54%	-7.99%
<b>Hit Rate (r&gt;0)</b>	62.6%	63.3%	55.4%	62.7%	67.5%	65.1%	63.9%	65.1%	53.0%	56.6%	55.4%	61.0%	69.5%	76.8%

#### BOTTOM DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	0.33%	-0.01%	3.96%	-0.67%	0.04%	1.05%	0.31%	-0.10%	1.31%	1.83%	-2.14%	-1.36%	0.52%	-0.89%
<b>Standard Deviation</b>	9.92%	9.98%	8.46%	7.97%	9.25%	12.35%	9.84%	9.59%	11.05%	12.48%	10.74%	9.31%	8.69%	6.75%
<b>Standard Error</b>	0.31%	0.33%	0.93%	0.87%	1.02%	1.36%	1.08%	1.05%	1.21%	1.37%	1.18%	1.03%	0.96%	0.74%
<b>t-stat</b>	1.03	-0.02	4.27	-0.76	0.04	0.78	0.29	-0.10	1.08	1.34	-1.81	-1.33	0.54	-1.20
<b>Sharpe Ratio</b>	0.11	0.00	1.62	-0.29	0.02	0.30	0.11	-0.04	0.41	0.51	-0.69	-0.51	0.21	-0.46
<b>Best</b>	-42.18%	-42.18%	-10.76%	-25.97%	-42.18%	-25.91%	-35.82%	-26.46%	-26.88%	-21.69%	-41.05%	-33.06%	-23.50%	-30.24%
<b>Worst</b>	93.26%	93.26%	35.70%	23.88%	44.46%	70.91%	47.67%	43.74%	73.83%	93.26%	51.47%	22.56%	22.66%	11.78%
<b>Hit Rate (r&lt;0)</b>	48.7%	50.1%	33.7%	54.2%	50.6%	49.4%	44.6%	53.0%	45.8%	42.2%	60.2%	54.9%	43.9%	52.4%

#### UNIVERSE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	0.92%	0.87%	1.47%	0.42%	0.72%	1.36%	0.68%	0.94%	1.49%	1.37%	-0.80%	0.24%	1.46%	1.70%
<b>Standard Deviation</b>	5.38%	5.44%	4.71%	3.99%	4.95%	6.42%	5.71%	5.19%	5.84%	6.04%	5.81%	6.16%	5.19%	3.58%
<b>Standard Error</b>	0.17%	0.18%	0.52%	0.44%	0.54%	0.71%	0.63%	0.57%	0.64%	0.66%	0.64%	0.68%	0.57%	0.40%
<b>t-stat</b>	5.39	4.83	2.83	0.96	1.33	1.93	1.08	1.65	2.32	2.06	-1.25	0.36	2.55	4.31
<b>Sharpe Ratio</b>	0.59	0.56	1.08	0.37	0.51	0.73	0.41	0.63	0.88	0.78	-0.47	0.14	0.98	1.65
<b>Best</b>	38.00%	38.00%	13.82%	10.97%	9.39%	38.00%	21.22%	23.86%	33.55%	36.61%	16.57%	16.60%	12.31%	10.87%
<b>Worst</b>	-28.86%	-28.86%	-7.91%	-15.12%	-23.78%	-17.83%	-21.86%	-15.55%	-10.78%	-15.21%	-28.86%	-22.45%	-11.94%	-13.24%
<b>Hit Rate (r&gt;0)</b>	62.03%	61.8%	65.1%	57.8%	61.4%	63.9%	63.9%	59.0%	54.2%	63.9%	47.0%	58.5%	69.5%	80.5%

Source: 10\_Portfolios\_Prior\_12\_2.txt; 27-Oct-09

## Appendix II -- F-F Momentum Model -- Average Alpha by Calendar Month

### All Stocks Universe: 1927-2009 -- Equal Weighting

#### TOP DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Alpha</b>	0.54%	0.67%	-0.93%	0.71%	1.05%	0.63%	0.58%	0.33%	-0.36%	-0.08%	0.66%	0.72%	0.98%	2.17%
<b>Standard Deviation</b>	3.56%	3.46%	4.33%	3.01%	2.79%	3.56%	2.83%	3.94%	4.08%	4.54%	3.65%	2.78%	3.03%	2.82%
<b>Standard Error</b>	0.11%	0.11%	0.48%	0.33%	0.31%	0.39%	0.31%	0.43%	0.45%	0.50%	0.40%	0.31%	0.33%	0.31%
<b>t-stat</b>	4.74	5.85	-1.96	2.14	3.44	1.60	1.85	0.77	-0.80	-0.16	1.65	2.34	2.94	6.98
<b>Sharpe Ratio</b>	0.52	0.67	-0.74	0.81	1.31	0.61	0.70	0.29	-0.30	-0.06	0.63	0.89	1.13	2.67
<b>Best</b>	18.36%	18.36%	15.46%	18.36%	12.45%	8.15%	8.49%	15.29%	4.69%	7.43%	7.33%	7.66%	9.09%	12.61%
<b>Worst</b>	-35.59%	-35.59%	-20.05%	-8.70%	-6.32%	-15.99%	-6.76%	-20.74%	-30.45%	-35.59%	-25.01%	-7.66%	-7.80%	-2.47%
<b>Hit Rate (<math>\alpha &gt; 0</math>)</b>	63.4%	65.5%	41.0%	62.7%	77.1%	72.3%	63.9%	59.0%	50.6%	56.6%	67.5%	61.0%	72.0%	78.0%

#### BOTTOM DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Alpha</b>	-0.27%	-0.73%	4.83%	-0.26%	-0.60%	-0.77%	0.01%	-0.94%	0.05%	-0.10%	-0.54%	-1.12%	-1.00%	-2.80%
<b>Standard Deviation</b>	5.20%	4.77%	6.83%	3.94%	3.67%	3.99%	4.32%	3.18%	4.11%	6.35%	7.92%	3.13%	5.43%	3.64%
<b>Standard Error</b>	0.17%	0.16%	0.75%	0.43%	0.40%	0.44%	0.47%	0.35%	0.45%	0.70%	0.87%	0.35%	0.60%	0.40%
<b>t-stat</b>	-1.62	-4.64	6.45	-0.61	-1.50	-1.76	0.01	-2.69	0.11	-0.14	-0.63	-3.25	-1.67	-6.97
<b>Sharpe Ratio</b>	-0.18	-0.53	2.45	-0.23	-0.57	-0.67	0.00	-1.02	0.04	-0.05	-0.24	-1.24	-0.64	-2.67
<b>Best</b>	-13.54%	-13.54%	-4.42%	-13.03%	-10.13%	-8.08%	-6.02%	-8.77%	-6.47%	-6.42%	-12.27%	-7.74%	-11.07%	-13.54%
<b>Worst</b>	64.69%	64.69%	40.35%	18.98%	17.68%	24.63%	20.21%	11.79%	25.72%	47.57%	64.69%	11.34%	26.23%	4.81%
<b>Hit Rate (<math>\alpha &lt; 0</math>)</b>	66.7%	70.7%	22.9%	61.4%	65.1%	72.3%	60.2%	75.9%	62.7%	74.7%	77.1%	76.8%	73.2%	78.0%

#### TOP MINUS BOTTOM DECILE SPREAD

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	0.80%	1.40%	-5.76%	0.97%	1.66%	1.40%	0.57%	1.27%	-0.41%	0.02%	1.21%	1.84%	1.98%	4.98%
<b>Standard Deviation</b>	7.90%	7.39%	10.04%	5.69%	5.70%	6.87%	6.25%	6.37%	7.61%	10.45%	11.06%	4.90%	7.12%	5.64%
<b>Standard Error</b>	0.25%	0.25%	1.10%	0.63%	0.63%	0.75%	0.69%	0.70%	0.84%	1.15%	1.21%	0.54%	0.79%	0.62%
<b>t-stat</b>	3.21	5.72	-5.23	1.55	2.65	1.85	0.83	1.82	-0.49	0.02	0.99	3.40	2.52	7.98
<b>Sharpe Ratio</b>	0.35	0.66	-1.99	0.59	1.01	0.70	0.32	0.69	-0.18	0.01	0.38	1.30	0.97	3.05
<b>Best</b>	22.58%	22.58%	16.76%	19.77%	22.58%	15.02%	12.61%	19.43%	9.62%	11.99%	19.60%	12.70%	14.70%	19.34%
<b>Worst</b>	-89.70%	-89.70%	-60.40%	-21.84%	-23.33%	-40.62%	-24.79%	-26.62%	-56.17%	-83.16%	-89.70%	-13.89%	-30.34%	-4.66%
<b>Hit Rate (<math>r &gt; 0</math>)</b>	66.2%	69.2%	32.5%	62.7%	72.3%	72.3%	61.4%	72.3%	55.4%	61.4%	77.1%	68.3%	76.8%	81.7%

Source: 10\_Portfolios\_Prior\_12\_2.txt; 27-Oct-09

## Appendix II -- F-F Momentum Model -- Average Alpha by Calendar Month

### All Stocks Universe: 1927-2009 -- Cap Weighting

#### TOP DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Alpha</b>	0.59%	0.65%	0.00%	0.97%	1.27%	0.74%	0.41%	0.64%	-0.50%	0.04%	0.64%	0.57%	0.64%	1.72%
<b>Standard Deviation</b>	3.66%	3.66%	3.63%	3.91%	2.97%	3.80%	3.34%	3.51%	3.73%	3.71%	3.21%	3.80%	4.42%	3.40%
<b>Standard Error</b>	0.12%	0.12%	0.40%	0.43%	0.33%	0.42%	0.37%	0.39%	0.41%	0.41%	0.35%	0.42%	0.49%	0.37%
<b>t-stat</b>	5.12	5.35	0.00	2.27	3.90	1.77	1.13	1.67	-1.21	0.11	1.81	1.36	1.32	4.58
<b>Sharpe Ratio</b>	0.56	0.61	0.00	0.86	1.48	0.67	0.43	0.63	-0.46	0.04	0.69	0.52	0.51	1.75
<b>Best</b>	24.61%	24.61%	8.32%	24.61%	7.44%	12.00%	9.48%	11.24%	7.61%	7.90%	6.90%	9.79%	12.47%	17.47%
<b>Worst</b>	-22.31%	-22.31%	-8.01%	-7.31%	-9.96%	-10.58%	-10.40%	-13.26%	-19.83%	-22.31%	-9.04%	-12.65%	-16.51%	-6.09%
<b>Hit Rate (<math>\alpha &gt; 0</math>)</b>	58.8%	59.7%	49.4%	59.0%	75.9%	67.5%	57.8%	57.8%	42.2%	48.2%	60.2%	58.5%	58.5%	70.7%

#### BOTTOM DECILE

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Alpha</b>	-0.60%	-0.88%	2.50%	-1.09%	-0.68%	-0.30%	-0.36%	-1.04%	-0.18%	0.46%	-1.34%	-1.61%	-0.95%	-2.60%
<b>Standard Deviation</b>	6.03%	5.96%	6.02%	4.97%	5.83%	7.16%	5.52%	5.49%	6.40%	7.72%	6.35%	5.12%	5.54%	4.46%
<b>Standard Error</b>	0.19%	0.20%	0.66%	0.55%	0.64%	0.79%	0.61%	0.60%	0.70%	0.85%	0.70%	0.56%	0.61%	0.49%
<b>t-stat</b>	-3.11	-4.44	3.78	-2.00	-1.06	-0.39	-0.60	-1.73	-0.26	0.55	-1.92	-2.85	-1.55	-5.27
<b>Sharpe Ratio</b>	-0.34	-0.51	1.44	-0.76	-0.40	-0.15	-0.23	-0.66	-0.10	0.21	-0.73	-1.09	-0.59	-2.02
<b>Best</b>	-19.88%	-19.88%	-8.29%	-19.44%	-18.40%	-16.29%	-15.22%	-12.83%	-16.10%	-9.45%	-15.88%	-14.10%	-15.47%	-19.88%
<b>Worst</b>	56.65%	56.65%	34.22%	13.40%	35.63%	35.41%	26.45%	24.38%	40.28%	56.65%	34.90%	14.95%	17.56%	5.57%
<b>Hit Rate (<math>\alpha &lt; 0</math>)</b>	63.0%	65.3%	38.6%	57.8%	66.3%	65.1%	65.1%	65.1%	63.9%	56.6%	68.7%	67.1%	65.9%	76.8%

#### TOP MINUS BOTTOM DECILE SPREAD

	All	Non-Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Return</b>	1.19%	1.53%	-2.50%	2.07%	1.95%	1.04%	0.78%	1.69%	-0.31%	-0.42%	1.97%	2.18%	1.59%	4.31%
<b>Standard Deviation</b>	8.01%	7.93%	8.01%	6.75%	7.13%	9.64%	7.07%	7.71%	9.02%	10.34%	7.63%	6.49%	7.29%	6.47%
<b>Standard Error</b>	0.25%	0.26%	0.88%	0.74%	0.78%	1.06%	0.78%	0.85%	0.99%	1.13%	0.84%	0.72%	0.80%	0.71%
<b>t-stat</b>	4.68	5.81	-2.84	2.79	2.49	0.98	1.00	1.99	-0.32	-0.37	2.36	3.04	1.98	6.04
<b>Sharpe Ratio</b>	0.51	0.67	-1.08	1.06	0.95	0.37	0.38	0.76	-0.12	-0.14	0.90	1.16	0.76	2.31
<b>Best</b>	26.10%	26.10%	11.97%	26.10%	24.89%	21.83%	22.51%	20.47%	18.90%	11.57%	21.07%	16.07%	17.10%	24.52%
<b>Worst</b>	-78.96%	-78.96%	-42.18%	-17.43%	-39.62%	-45.99%	-28.39%	-33.14%	-60.11%	-78.96%	-43.94%	-15.75%	-22.34%	-10.08%
<b>Hit Rate (<math>r &gt; 0</math>)</b>	64.6%	66.5%	43.4%	59.0%	73.5%	72.3%	63.9%	65.1%	49.4%	57.8%	71.1%	74.4%	67.1%	78.0%

Source: 10\_Portfolios\_Prior\_12\_2.txt; 27-Oct-09

## Appendix III -- F-F Momentum Model -- Average January Alpha by Decade

All Stocks Universe: 1927-2009 -- Equal Weighting

### TOP DECILE

	All	'27-'29	'30-'39	'40-'49	'50-'59	'60-'69	'70-'79	'80-'89	'90-'99	'00-'09
Mean Alpha	-0.93%	1.85%	-3.14%	2.29%	-0.79%	-0.93%	-2.49%	-0.99%	-0.51%	-1.71%
Standard Deviation	4.33%	3.66%	2.96%	5.82%	2.32%	2.20%	5.04%	2.92%	1.71%	7.40%
Standard Error	0.48%	2.11%	0.93%	1.84%	0.73%	0.70%	1.59%	0.92%	0.54%	2.34%
t-stat	-1.96	0.88	-3.37	1.24	-1.08	-1.33	-1.56	-1.07	-0.93	-0.73
Sharpe Ratio	-0.74	1.75	-3.69	1.36	-1.18	-1.46	-1.71	-1.18	-1.02	-0.80
Best	15.46%	6.07%	2.01%	15.46%	2.60%	2.97%	3.93%	3.94%	2.64%	5.05%
Worst	-20.05%	-0.46%	-6.79%	-3.82%	-5.37%	-4.47%	-11.57%	-5.35%	-2.71%	-20.05%
Hit Rate ( $\alpha > 0$ )	41.0%	2.6%	8.6%	4.9%	3.7%	4.8%	9.1%	6.3%	5.4%	3.7%

### BOTTOM DECILE

	All	'27-'29	'30-'39	'40-'49	'50-'59	'60-'69	'70-'79	'80-'89	'90-'99	'00-'09
Mean Alpha	4.83%	-1.22%	7.74%	4.92%	2.60%	2.89%	4.72%	3.32%	7.22%	7.08%
Standard Deviation	6.83%	0.66%	7.75%	7.89%	3.54%	3.73%	5.85%	2.49%	5.36%	12.68%
Standard Error	0.75%	0.38%	2.45%	2.50%	1.12%	1.18%	1.85%	0.79%	1.69%	4.01%
t-stat	6.45	-3.17	3.16	1.97	2.32	2.45	2.55	4.22	4.26	1.77
Sharpe Ratio	2.45	-6.34	3.46	2.16	2.54	2.68	2.80	4.62	4.67	1.93
Best	-4.42%	-1.71%	-1.50%	-1.79%	-0.91%	-1.04%	-2.85%	0.68%	2.99%	-4.42%
Worst	40.35%	-0.46%	21.92%	19.76%	10.41%	12.29%	16.11%	8.32%	20.05%	40.35%
Hit Rate ( $\alpha < 0$ )	22.9%	100.0%	20.0%	50.0%	40.0%	30.0%	30.0%	20.0%	0.0%	50.0%

### TOP MINUS BOTTOM DECILE SPREAD

	All	'27-'29	'30-'39	'40-'49	'50-'59	'60-'69	'70-'79	'80-'89	'90-'99	'00-'09
Mean Return	-5.76%	3.07%	-10.89%	-2.63%	-3.39%	-3.82%	-7.22%	-4.31%	-7.73%	-8.79%
Standard Deviation	10.04%	3.02%	9.61%	11.34%	5.64%	4.92%	10.73%	4.59%	5.13%	19.54%
Standard Error	1.10%	1.74%	3.04%	3.59%	1.78%	1.56%	3.39%	1.45%	1.62%	6.18%
t-stat	-5.23	1.76	-3.58	-0.73	-1.90	-2.46	-2.13	-2.97	-4.76	-1.42
Sharpe Ratio	-1.99	3.52	-3.92	-0.80	-2.08	-2.69	-2.33	-3.25	-5.21	-1.56
Best	16.76%	6.53%	2.61%	16.76%	2.81%	1.45%	6.78%	3.06%	-0.93%	5.64%
Worst	-60.40%	1.02%	-27.39%	-22.41%	-15.78%	-14.55%	-27.68%	-10.08%	-19.57%	-60.40%
Hit Rate ( $r > 0$ )	32.5%	1.4%	16.3%	9.8%	6.3%	7.7%	13.8%	9.6%	12.6%	10.8%

Source: LONG-TERM DECILE RETURN ANALYSIS-MOMENTUM.xls; 3-Feb-10





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