Sell in May and Go Away in the Equity Index Futures Markets

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Abstract

The period May 1 to the turn of the month of November (last five trading days October) has historically produced negligible returns. The rest of the year (late October to the end of April) has essentially all the year's gains. In this paper we show that there is a statistically significant difference and conclude that the strategy *go to cash in the weak period and go long in the strong period* has about double the returns of buy and hold for large cap S&P500 index and triple for the small cap Russell2000 index during the period 1993-2015 in the index futures markets.

JEL: C19, C41, G11

1 Sell-in-May-and-go-away

September and October have historically had low stock market returns with many serious declines or crashes occurring in October. Also the months of November to February have historically had higher than average returns; see, for example, Gultekin and Gultekin (1983) and various papers in Keim and Ziemba (2000) and Ziemba (2012). This suggests the strategy to avoid the bad months and be in cash then and only be long the stock market in the good months. Sell-in-May-and-go-away, which is sometimes called the *Halloween Effect*, is one such strategy that is often discussed in the financial press.

For the S&P500 a buy and hold strategy turns \$1 on February 4, 1993 into \$3.05 on December 16, 2015; whereas, sell in May and move into cash, counting interest (Fed funds effective monthly rate for sell in May) and dividends for the buy and hold, had a final wealth

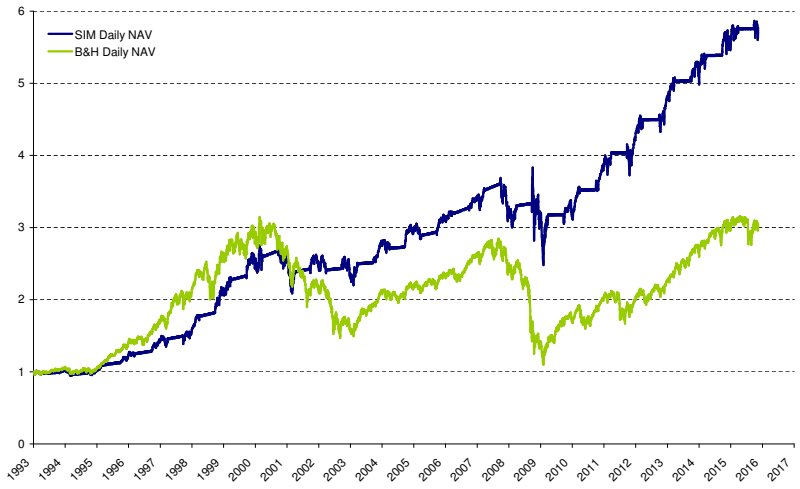

Figure 1: S&P500 Futures Sell in May (SIM) and B&H Cumulative Returns Comparison. 1993-2015. (Entry at Close on 6th Day before End of October. Exit 1st Day of May.)

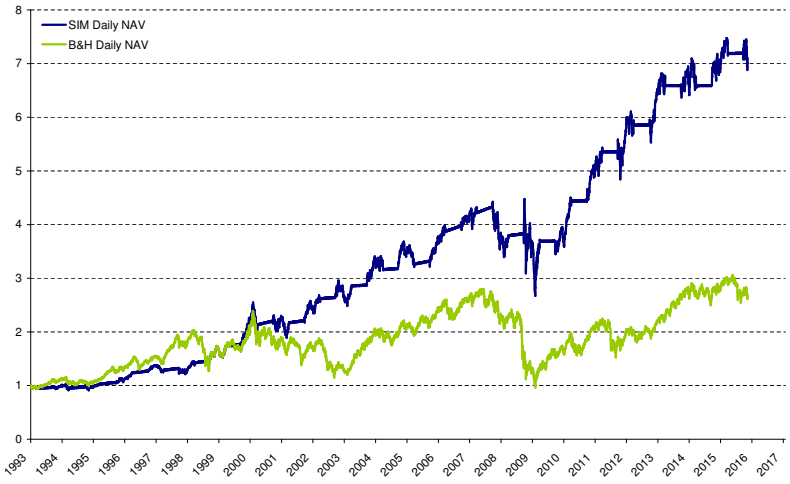

Figure 2: Russell2000 Futures Sell in May (SIM) and B&H Cumulative Returns Comparison. 1993-2015. (Entry at Close on 6th Day before End of October. Exit 1st Day of May.)

Table 1: Data by month for sell in May and go away versus buy and hold for the S&P500 equty index futures, 1993-2015

SIM Trading in SP500 futures contract. Geometrically Linked Returns. Entry at Close on 6th Business Day before End of October, Exit Close of 1st Business Day of May.																															
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average	StDev	t
Jan		3.14%	2.33%	3.07%	5.69%	0.73%	2.71%	-5.91%	2.97%	-1.76%	-2.98%	1.82%	-2.67%	2.25%	1.00%	-6.82%	-9.14%	-3.72%	2.30%	4.41%	5.11%	-3.56%	-3.23%	-0.10%	0.041	-0.118
Feb	-1.27%	-3.29%	2.73%	-0.02%	0.28%	6.30%	-3.76%	-2.20%	-9.94%	-2.22%	-1.73%	1.28%	1.85%	-0.13%	-2.46%	-3.63%	-11.13%	2.98%	3.35%	4.27%	1.28%	4.49%	5.71%	-0.32%	0.044	-0.345
Mar	1.83%	-4.22%	3.92%	1.94%	-4.24%	5.65%	4.49%	10.07%	-5.89%	3.73%	0.44%	-1.82%	-1.72%	1.61%	1.49%	-0.85%	7.28%	5.57%	-0.51%	2.78%	3.25%	0.33%	-2.07%	**1.44%**	0.039	1.774
Apr	-3.13%	0.74%	2.43%	0.49%	5.69%	0.70%	3.19%	-2.36%	6.83%	-6.38%	8.00%	-1.73%	-2.23%	0.94%	3.97%	4.55%	9.07%	1.47%	2.89%	-0.76%	1.79%	0.65%	0.85%	**1.64%**	0.037	2.133
May	1.05%	0.87%	0.21%	0.68%	0.34%	1.35%	2.01%	-0.10%	1.78%	1.18%	-0.02%	0.97%	0.68%	-0.18%	0.72%	1.99%	0.71%	1.29%	-0.14%	0.50%	-0.93%	0.00%	1.10%	**0.70%**	0.007	4.508
Jun	0.27%	0.35%	0.49%	0.40%	0.47%	0.49%	0.43%	0.54%	0.32%	0.13%	0.10%	0.09%	0.25%	0.42%	0.42%	0.17%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.24%**	0.002	5.804
Jul	0.25%	0.34%	0.50%	0.49%	0.47%	0.47%	0.41%	0.56%	0.33%	0.16%	0.09%	0.11%	0.26%	0.45%	0.46%	0.17%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.24%**	0.002	5.768
Aug	0.27%	0.40%	0.49%	0.43%	0.44%	0.47%	0.44%	0.55%	0.31%	0.14%	0.08%	0.13%	0.32%	0.45%	0.43%	0.16%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.24%**	0.002	5.862
Sep	0.25%	0.39%	0.46%	0.45%	0.49%	0.45%	0.43%	0.52%	0.23%	0.15%	0.09%	0.13%	0.30%	0.42%	0.38%	0.16%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.23%**	0.002	5.854
Oct	0.96%	3.33%	0.38%	0.96%	5.93%	2.62%	6.07%	5.28%	-3.67%	-1.38%	1.89%	3.30%	1.15%	-0.06%	2.30%	10.90%	-4.16%	-0.07%	0.06%	0.12%	0.14%	2.63%	0.37%	**1.70%**	0.033	2.502
Nov	-1.35%	-4.78%	3.98%	6.80%	3.21%	5.06%	1.04%	-8.46%	7.35%	5.49%	0.75%	3.83%	3.39%	1.39%	-4.85%	-9.22%	5.88%	-0.11%	-0.61%	0.44%	3.00%	2.72%	0.24%	**1.10%**	0.045	1.173
Dec	1.09%	1.59%	1.80%	-1.93%	2.40%	6.92%	6.60%	0.30%	0.71%	-6.25%	4.82%	3.34%	0.27%	1.80%	-0.56%	-0.40%	1.40%	6.18%	0.37%	0.32%	2.01%	-0.78%		**1.45%**	0.030	2.303
Average	**0.02%**	-0.10%	**1.64%**	**1.15%**	**1.77%**	**2.60%**	**2.00%**	-0.10%	**0.11%**	-0.58%	**0.96%**	**0.95%**	**0.16%**	**0.78%**	**0.27%**	-0.24%	0.00%	**1.14%**	**0.64%**	**1.01%**	**1.31%**	**0.54%**	**0.27%**	**0.71%**		
StDev	0.014	0.026	0.014	0.021	0.030	0.026	0.029	0.047	0.049	0.035	0.029	0.019	0.017	0.008	0.022	0.051	0.060	0.027	0.014	0.018	0.018	0.020	0.022			
t	0.046	-0.125	4.034	1.868	2.052	3.463	2.430	-0.075	0.078	-0.586	1.149	1.776	0.315	3.330	0.427	-0.160	-0.001	1.459	1.628	1.982	2.540	0.950	0.411			
Geom r	0.11%	-1.52%	21.49%	14.40%	22.78%	35.62%	26.34%	-2.43%	-0.01%	-7.40%	11.67%	11.86%	1.71%	9.72%	3.06%	-4.19%	-2.02%	14.10%	7.90%	12.64%	16.65%	6.46%	2.80%			
B&H Trading in S&P500 futures contract. Geometrically Linked Returns.																										
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average	StDev	t
Jan		3.14%	2.33%	3.07%	5.69%	0.73%	2.71%	-5.91%	2.97%	-1.76%	-2.98%	1.82%	-2.67%	2.25%	1.00%	-6.82%	-9.14%	-3.72%	2.30%	4.41%	5.11%	-3.56%	-3.23%	-0.10%	0.041	-0.118
Feb	-1.33%	-3.29%	2.73%	-0.02%	0.28%	6.30%	-3.76%	-2.20%	-9.94%	-2.22%	-1.73%	1.28%	1.85%	-0.13%	-2.46%	-3.63%	-11.13%	2.98%	3.35%	4.27%	1.28%	4.49%	5.71%	-0.32%	0.044	-0.347
Mar	1.83%	-4.22%	3.92%	1.94%	-4.24%	5.65%	4.49%	10.07%	-5.89%	3.73%	0.44%	-1.82%	-1.72%	1.61%	1.49%	-0.85%	7.28%	5.57%	-0.51%	2.78%	3.25%	0.33%	-2.07%	**1.44%**	0.039	1.774
Apr	-3.13%	0.74%	2.43%	0.49%	5.69%	0.70%	3.19%	-2.36%	6.83%	-6.38%	8.00%	-1.73%	-2.23%	0.94%	3.97%	4.55%	9.07%	1.47%	2.89%	-0.76%	1.79%	0.65%	0.85%	**1.64%**	0.037	2.133
May	2.56%	1.26%	3.15%	1.78%	5.84%	-2.69%	-3.08%	-4.54%	-0.04%	-1.10%	5.05%	1.34%	2.88%	-3.41%	2.96%	0.96%	5.27%	-8.41%	-1.21%	-6.15%	2.27%	2.29%	1.26%	**0.36%**	0.037	0.474
Jun	0.17%	-2.50%	2.54%	1.45%	4.52%	4.61%	6.41%	3.12%	-1.44%	-7.45%	0.95%	1.64%	0.24%	0.47%	-1.22%	-8.69%	-0.44%	-5.94%	-2.23%	3.41%	-1.94%	1.59%	-2.52%	-0.14%	0.038	-0.180
Jul	-0.69%	3.09%	2.88%	-5.22%	7.47%	-1.86%	-2.99%	-2.10%	-1.98%	-8.64%	1.54%	-3.50%	3.43%	0.12%	-3.65%	-1.30%	7.34%	6.80%	-2.16%	1.26%	5.05%	-1.46%	2.08%	**0.24%**	0.041	0.279
Aug	3.39%	3.28%	-0.07%	1.32%	-5.91%	-15.59%	-1.73%	5.73%	-6.72%	0.05%	1.80%	0.21%	-1.28%	1.84%	0.79%	1.07%	3.46%	-4.69%	-6.40%	2.18%	-2.98%	3.95%	-6.46%	-0.99%	0.048	-0.979
Sep	-0.87%	-2.17%	4.48%	6.09%	5.51%	6.86%	-1.79%	-4.58%	-8.38%	-11.31%	-1.43%	0.94%	1.03%	3.02%	4.07%	-9.79%	3.16%	8.31%	-7.85%	2.03%	2.60%	-1.83%	-3.26%	-0.22%	0.054	-0.198
Oct	1.87%	2.59%	-0.77%	2.59%	-3.78%	7.38%	5.73%	-1.15%	1.46%	7.96%	5.51%	1.32%	-2.08%	2.79%	1.00%	-20.11%	-2.07%	3.74%	10.51%	-1.97%	4.50%	2.17%	8.55%	**1.64%**	0.060	1.302
Nov	-1.35%	-4.78%	3.98%	6.80%	3.21%	5.06%	1.04%	-8.46%	7.35%	5.49%	0.75%	3.83%	3.39%	1.39%	-4.85%	-9.22%	5.88%	-0.11%	-0.61%	0.44%	3.00%	2.72%	0.24%	**1.10%**	0.045	1.173
Dec	1.09%	1.59%	1.80%	-1.93%	2.40%	6.92%	6.60%	0.30%	0.71%	-6.25%	4.82%	3.34%	0.27%	1.80%	-0.56%	-0.40%	1.40%	6.18%	0.37%	0.32%	2.01%	-0.78%		**1.45%**	0.030	2.303
Average	**0.32%**	-0.11%	**2.45%**	**1.53%**	**2.22%**	**2.01%**	**1.40%**	-1.01%	-1.26%	-2.32%	**1.89%**	**0.72%**	**0.26%**	**1.06%**	**0.21%**	-4.52%	**1.67%**	**1.02%**	-0.13%	**1.02%**	**2.16%**	**0.88%**	**0.10%**	**0.51%**		
StDev	0.020	0.031	0.016	0.032	0.046	0.066	0.039	0.052	0.056	0.060	0.033	0.021	0.023	0.017	0.029	0.067	0.064	0.056	0.048	0.030	0.025	0.024	0.043			
t	0.539	-0.120	5.466	1.652	1.687	1.063	1.229	-0.672	-0.774	-1.352	1.977	1.172	0.394	2.135	0.257	-2.321	0.903	0.634	-0.095	1.184	2.995	1.248	0.081			
Geom r	3.41%	-1.78%	33.54%	19.34%	28.75%	23.93%	17.18%	-12.73%	-15.61%	-26.10%	24.53%	8.76%	2.85%	13.29%	2.11%	-44.22%	19.28%	11.00%	-2.76%	12.38%	28.83%	10.73%	0.24%			

Table 2: Data by month for sell in May and go away versus buy and hold for the Russell2000 equity futures, 1993-2015

SIM Trading in Russell 2000 futures contract. Geometrically Linked Returns. Entry at Close on 6th Business Day before End of October, Exit 1st Business Day of May.																														
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average	StDev	t
Jan		2.95%	-1.60%	-0.32%	2.04%	-2.48%	0.32%	-3.17%	3.91%	-1.37%	-3.03%	4.16%	-4.50%	8.54%	1.12%	-7.74%	-11.93%	-3.79%	-0.41%	7.04%	6.24%	-2.95%	-3.48%	-0.48%	0.048	-0.461
Feb	-3.15%	-1.43%	4.17%	1.58%	-2.87%	7.31%	-8.02%	16.64%	-7.33%	-3.05%	-3.21%	0.67%	1.39%	-0.70%	-1.35%	-4.18%	-12.63%	4.35%	5.34%	2.26%	1.04%	4.63%	6.01%	**0.32%**	0.060	0.258
Mar	2.59%	-4.43%	1.38%	3.48%	-4.20%	5.20%	1.15%	-6.53%	-3.92%	8.00%	0.93%	0.62%	-2.69%	5.34%	1.51%	-0.01%	6.83%	7.74%	2.08%	2.04%	4.23%	-1.09%	1.32%	**1.37%**	0.039	1.673
Apr	-3.05%	-0.55%	2.39%	4.59%	-0.10%	-0.13%	8.47%	-7.92%	6.33%	0.56%	9.29%	-5.36%	-6.16%	-0.48%	1.29%	3.79%	14.65%	5.50%	2.56%	-1.71%	-0.63%	-4.15%	-2.67%	**1.15%**	0.053	1.033
May	1.01%	1.65%	0.12%	1.07%	1.70%	0.94%	1.58%	3.29%	1.68%	0.59%	0.21%	0.65%	1.07%	-0.64%	0.59%	1.80%	-0.15%	2.02%	-1.31%	-0.33%	-2.57%	0.02%	0.65%	**0.68%**	0.012	2.658
Jun	0.27%	0.35%	0.48%	0.40%	0.47%	0.49%	0.43%	0.54%	0.32%	0.13%	0.10%	0.09%	0.25%	0.41%	0.42%	0.17%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.24%**	0.002	5.813
Jul	0.25%	0.34%	0.50%	0.49%	0.47%	0.47%	0.41%	0.56%	0.33%	0.16%	0.09%	0.10%	0.26%	0.44%	0.46%	0.17%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.24%**	0.002	5.760
Aug	0.27%	0.40%	0.49%	0.43%	0.44%	0.47%	0.44%	0.55%	0.31%	0.14%	0.08%	0.12%	0.31%	0.45%	0.43%	0.16%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.24%**	0.002	5.852
Sep	0.25%	0.39%	0.46%	0.45%	0.49%	0.45%	0.43%	0.52%	0.24%	0.15%	0.09%	0.13%	0.30%	0.42%	0.38%	0.16%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	**0.23%**	0.002	5.857
Oct	1.47%	2.27%	0.13%	-0.25%	5.75%	1.82%	3.11%	5.39%	-2.14%	0.12%	2.64%	2.14%	0.90%	0.10%	2.64%	15.46%	-6.68%	0.02%	0.88%	0.44%	-1.73%	4.93%	-0.32%	**1.70%**	0.040	2.038
Nov	-4.28%	-4.75%	4.42%	3.89%	-1.16%	4.24%	4.69%	-10.54%	7.38%	8.50%	3.30%	8.42%	4.38%	2.04%	-7.96%	-14.20%	2.87%	3.31%	-1.00%	0.38%	3.93%	0.00%	3.15%	**0.91%**	0.058	0.749
Dec	4.12%	2.84%	3.13%	2.01%	2.05%	6.76%	12.58%	8.02%	5.94%	-5.87%	1.78%	3.06%	-0.03%	0.88%	0.10%	3.42%	7.60%	7.62%	-0.03%	3.06%	1.64%	2.32%		**3.32%**	0.038	4.140
Average	-0.02%	**0.00%**	**1.34%**	**1.49%**	**0.42%**	**2.13%**	**2.13%**	**0.61%**	**1.09%**	**0.67%**	**1.02%**	**1.23%**	-0.38%	**1.40%**	-0.03%	-0.08%	**0.05%**	**2.24%**	**0.68%**	**1.10%**	**1.01%**	**0.31%**	**0.43%**	0.82%		
StDev	0.025	0.025	0.018	0.017	0.025	0.030	0.050	0.074	0.043	0.040	0.032	0.032	0.028	0.028	0.027	0.071	0.078	0.035	0.018	0.023	0.026	0.026	0.026			
t	-0.029	0.004	2.555	3.090	0.579	2.432	1.474	0.286	0.866	0.581	1.094	1.328	-0.463	1.747	-0.039	-0.041	0.023	2.198	1.274	1.678	1.357	0.410	0.555			
Geom r	-0.57%	-0.31%	17.12%	19.18%	4.83%	28.12%	27.12%	4.49%	12.69%	7.46%	12.36%	15.20%	-4.84%	17.69%	-0.77%	-3.68%	-2.74%	29.53%	8.26%	13.75%	12.46%	3.43%	4.48%			
B&H Trading in Russell 2000 futures contract. Geometrically Linked Returns.																										
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average	StDev	t
Jan		2.95%	-1.60%	-0.32%	2.04%	-2.48%	0.32%	-3.17%	3.91%	-1.37%	-3.03%	4.16%	-4.50%	8.54%	1.12%	-7.74%	-11.93%	-3.79%	-0.41%	7.04%	6.24%	-2.95%	-3.48%	-0.48%	0.048	-0.461
Feb	-4.20%	-1.43%	4.17%	1.58%	-2.87%	7.31%	-8.02%	16.64%	-7.33%	-3.05%	-3.21%	0.67%	1.39%	-0.70%	-1.35%	-4.18%	-12.63%	4.35%	5.34%	2.26%	1.04%	4.63%	6.01%	**0.28%**	0.061	0.221
Mar	2.59%	-4.43%	1.38%	3.48%	-4.20%	5.20%	1.15%	-6.53%	-3.92%	8.00%	0.93%	0.62%	-2.69%	5.34%	1.51%	-0.01%	6.83%	7.74%	2.08%	2.04%	4.23%	-1.09%	1.32%	**1.37%**	0.039	1.673
Apr	-3.05%	-0.55%	2.39%	4.59%	-0.10%	-0.13%	8.47%	-7.92%	6.33%	0.56%	9.29%	-5.36%	-6.16%	-0.48%	1.29%	3.79%	14.65%	5.50%	2.56%	-1.71%	-0.63%	-4.15%	-2.67%	**1.15%**	0.053	1.033
May	4.00%	-1.16%	2.21%	3.17%	10.25%	-6.34%	1.64%	-7.30%	1.83%	-4.81%	10.49%	1.34%	6.16%	-6.26%	3.54%	4.26%	2.51%	-8.25%	-2.02%	-6.76%	3.91%	0.74%	2.25%	**0.67%**	0.053	0.607
Jun	1.51%	-3.49%	4.64%	-3.66%	4.75%	1.13%	4.66%	9.34%	3.00%	-5.14%	1.53%	4.10%	4.11%	0.94%	-0.86%	-7.82%	0.93%	-8.54%	-2.83%	4.19%	-0.99%	4.98%	0.40%	**0.73%**	0.044	0.798
Jul	0.55%	2.00%	5.28%	-9.32%	4.13%	-9.34%	-3.88%	-3.52%	-5.04%	-15.86%	5.96%	-7.03%	5.96%	-3.90%	-7.41%	3.05%	9.29%	6.48%	-3.78%	-1.50%	6.95%	-6.28%	-1.28%	-1.24%	0.065	-0.915
Aug	3.95%	5.42%	1.44%	5.01%	1.98%	-20.31%	-3.99%	6.04%	-3.70%	-0.82%	4.35%	-0.81%	-2.30%	2.30%	1.42%	3.18%	2.64%	-7.67%	-10.27%	3.29%	-3.26%	5.04%	-6.54%	-0.59%	0.062	-0.456
Sep	2.47%	-0.58%	1.82%	4.17%	7.70%	8.02%	0.36%	-1.99%	-13.82%	-7.55%	-2.13%	4.64%	0.66%	1.34%	2.15%	-9.21%	5.30%	11.85%	-12.25%	2.79%	6.02%	-6.62%	-5.48%	-0.02%	0.066	-0.011
Oct	2.96%	-0.40%	-5.11%	-1.50%	-5.13%	3.75%	0.44%	-5.48%	5.24%	2.48%	8.11%	1.71%	-3.62%	5.21%	2.15%	-24.11%	-7.11%	4.00%	14.14%	-2.24%	2.35%	6.55%	5.49%	**0.43%**	0.073	0.281
Nov	-4.28%	-4.75%	4.42%	3.89%	-1.16%	4.24%	4.69%	-10.54%	7.38%	8.50%	3.30%	8.42%	4.38%	2.04%	-7.96%	-14.20%	2.87%	3.31%	-1.00%	0.38%	3.93%	0.00%	3.15%	**0.91%**	0.058	0.749
Dec	4.12%	2.84%	3.13%	2.01%	2.05%	6.76%	12.58%	8.02%	5.94%	-5.87%	1.78%	3.06%	-0.03%	0.88%	0.10%	3.42%	7.60%	7.62%	-0.03%	3.06%	1.64%	2.32%		**3.32%**	0.038	4.140
Average	**0.97%**	-0.30%	**2.02%**	**1.09%**	**1.62%**	-0.18%	**1.53%**	-0.54%	-0.02%	-2.08%	**3.11%**	**1.29%**	**0.28%**	**1.27%**	-0.36%	-4.13%	**1.75%**	**1.88%**	-0.71%	**1.07%**	**2.62%**	**0.26%**	-0.07%	0.54%		
StDev	0.033	0.031	0.029	0.042	0.047	0.084	0.056	0.085	0.066	0.067	0.047	0.043	0.042	0.040	0.037	0.089	0.084	0.071	0.069	0.037	0.032	0.046	0.042			
t	0.976	-0.329	2.388	0.896	1.205	-0.076	0.948	-0.219	-0.009	-1.072	2.302	1.049	0.231	1.098	-0.338	-1.614	0.722	0.924	-0.357	1.016	2.855	0.200	-0.059			
Geom r	10.56%	-4.03%	26.46%	12.78%	19.88%	-6.17%	18.06%	-9.77%	-2.67%	-24.27%	42.85%	15.50%	2.43%	15.38%	-4.95%	-42.69%	18.43%	21.75%	-10.51%	12.81%	35.65%	2.03%	-1.69%			

of $5.77, some 89.2% higher. For the Russell2000, the final wealths were $2.70 and $7.11, respectively, some 163.3% higher. Figures 1 and 2 show this strategy using the rule sell on the first trading day in May and buy on the 6th trading day before the end of October, for the S&P500 and Russell2000 index futures for the years 1993-2015, respectively. This rule did indeed beat a buy and hold strategy by two and three times in final wealth with lower standard deviation risk. Tables 1 and 2 show the monthly returns, respectively, for those 22 years. The strategy works in most but not all years and in strategy design can be combined with other effects depending upon market conditions.

2 Statistical Tests

To show statistical significance, we tested the following three hypotheses:

1. Is the mean return for sell in May higher than buy and hold for the S&P500?
2. Is the mean return for sell in May higher than buy and hold for the Russell2000 ?
3. Is the sell in May Russell2000 mean return greater than the sell in May S&P500 mean return?

In testing the null hypothesis regarding equality of mean rates of return in two populations, the null and alternative hypothesis are:

$$H_0 : r_{B\&H} - r_{SIM} \geqslant 0$$
$$H_1 : r_{B\&H} - r_{SIM} \leqslant 0$$

The first population (B&H) is the average daily geometric rate of return using a buy and hold strategy ($r_{B\&H}$). The second population (SIM) is the average daily geometric rate of return for the Sell in May strategy (r_{SIM}) in the period entry at the close of the sixth trading day before the end of October and exit at the close of the first trading day in May the next year. The total period for the analysis is from February 5, 1993 to January 1, 2016, 5,803 days. The test compares the two groups of returns, assumed to follow normal distributions. The groups are independent, with sizes ($n_{B\&H}$) and (n_{SIM}), respectively, are 2,824 and 2,979 days and their variances are ($s_{B\&H}$) and (s_{SIM}).

The graphs show that the cumulative returns for SIM are higher than the respective cumulative returns for B&H, thus a one-tail test is recommended. To prove the research hypothesis that SIM mean returns are significantly higher than those for B&H, the null hypothesis that SIM mean returns are significantly lower or equal than those for B&H is tested and a two-sample, independent samples one-tail Z test at the 0.05 level of significance is conducted.

The Z-score for the S&P500 futures is -1.86 which is in the rejection region with a cutoff -1.645. The P-value is 0.0314 which is lower than the standard 5%. Hence the null hypothesis is rejected and the conclusion is that the average daily return for SIM is significantly higher than the average daily return for B&H.

The Z-score for the Russell2000 futures is -2.02 which is in the 5% rejection region. The P-value is 0.0217 which is lower than 5%. Hence the null hypothesis is rejected and the conclusion is that average daily return for SIM is significantly higher than average daily return for B&H.

To prove the research hypothesis that the SIM Russell2000 mean returns are higher than the SIM S&P500 mean returns, the null hypothesis that SIM Russell2000 mean returns are equal to SIM S&P500 mean returns is tested and an independent 2-sample two-tail Z test at the 0.05 level of significance is conducted. The Z-score for the test is -0.19 with cutoff -1.96 and P-value of 0.8493. Based on the results the null-hypothesis cannot be rejected.

$$Z = \frac{\bar{r}_{B\&H} - \bar{r}_{SIM}}{\sqrt{\frac{s^2_{B\&H}}{n^2_{B\&H}} + \frac{s^2_{SIM}}{n^2_{SIM}}}}$$

3 Discussion

Doeswijk (2005) offers a new hypotheses after reviewing two existing explanatory hypotheses for this phenomenon. Bouman and Jacobsen (2002) confirm the empirical and historical basis of the maxim, finding that the Sell in May effect holds in 36 of the 37 countries included in their analysis. They consider vacation timing as a potential cause of the Sell in May effect, suggesting the timing of summer vacations may cause temporal variation in appetites for risk aversion. However, they find evidence of the Sell in May effect in their subset of Southern hemisphere countries, which under their hypothesis would be expected to have a different seasonal pattern.

Another hypothesized link between seasonality and stock returns is the Seasonal Affective Disorder (SAD), which was studied by Kamstra, Kramer, and Levi (2003) and Garrett, Kamstra, and Kramer (2004). SAD is a disorder in which the shorter, relatively sunless days of fall and winter cause depression, which some recent research links to an unwillingness to take risk. Kamstra, Kramer, and Levi (2003) conclude that the SAD explanation does not lead to a profitable trading strategy because the risk premium varies with the seasonal effects. Like the vacation timing hypothesis, Doeswijk finds the SAD hypothesis insufficient because SAD is known to start as early as September so the historically high November returns cannot be explained.

Doeswijk (2005) offers a new hypothesis to explain the Sell in May effect. He posits that, in the fourth quarter of each year, investors are overly optimistic about the upcoming year. This excessive optimism leads to attractive initial returns followed by a renewed realism that readjusts expectations. Unlike the SAD hypothesis, which suggests a varying risk premium, the Optimism Cycle hypothesis reflects a constant risk premium but a varying perception of the economic outlook. To test this hypothesis, Doeswijk ran three analyses: 1) the global zero-investment seasonal sector-rotation strategy 2) the seasonality of earnings growth revisions and 3) the initial returns of IPOs as a proxy for investor optimism.

According to the Optimism Cycle, investors are over-optimistic at the end and beginning of the year. If this hypothesis is correct, a winning investment strategy is going long in cyclical stocks and short in defensive stocks during the winter period from November through April (winter) and following the opposite strategy from May through October (summer). (These stock groups are chosen for their relative exposure to the general economy, with cyclical stocks having a high exposure and defensive stocks a low exposure.) To test this strategy, Doeswijk uses the MSCI World index of global stock returns from 1970-2003 and tests the data as a whole, in two 17-year sub-periods, using several variations on timing of the winter period, and various sector definitions. The study runs regressions using monthly market capitalization-weighted price return indices and their monthly log returns.

Doeswijk finds that, on average during the study period, winter returns are a significant 7.6% higher than summer returns and the strategy is successful in 65% of the years. On a monthly basis, the average performance of the global zero-investment strategy is 0.56%, which is significant at the 1% confidence level. Using further regression analysis techniques, Doeswijk also isolates the market timing effects from the seasonality and finds that seasonality alone accounts for approximately half of the excess returns.

Like the Optimism Cycle strategy, both other analyses in the Doeswijk study support the Optimism Cycle hypothesis. Doeswijk finds that expected earnings growth rates follow a seasonal cycle and that these changes have an effect on stock performance. The third analysis uses initial IPO returns, which show a remarkable seasonality, as a proxy for investor confidence. Using this investor confidence proxy as an independent variable, the regression result for remaining excess return is not statistically significant, which supports the Optimism Cycle hypothesis.

Along with the three supporting analyses, Doeswijk explains a qualitative argument in favor of his Optimism Cycle hypothesis. He argues that, since this phenomenon is one based on an aspect of human psychology, it tricks investors into repeating the same biases every year. Importantly, this cycle of optimism and pessimism is not generally accepted, which Doeswijk argues allows for investors who understand it to profit from it as a free lunch until it is more widely accepted and the arbitrage opportunity is absorbed into the market.

Ziegler and Ziemba (2015) have also studied the effect of weather on the sell in May research in many countries and find that when the weather is good, the returns are higher on average.

4 Conclusions

Whatever the reasons, it seems clear that there is some sell in May and go away anomaly effect in the US and other equity markets. Getting double or triple final with less standard deviation risk and a higher Sharpe ratio suggests that the strategy adds value. Given tax considerations, implementation of this could be by shorting index futures which is simpler than exiting equity positions.

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