Vas ist das?*

The turn-of-the-year effect and the return premia of small firms.

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For eighteen consecutive years, from 1963 through 1980, average returns of small firms have been larger than average returns of large firms on the first trading day of the calendar year. That day's difference in returns between equally-weighted indices of AMEX-listed and NYSE-listed stocks has averaged 1.16% over the 18 years. The t-statistic of the difference was 8.18. For the 18 calendar years available on the current CRSP tape, the equally-weighted index return exceeded the value-weighted return on the first trading day of every year. The mean difference in returns was 1.19% and the t-statistic of the difference was 8.39. Although data on equally-weighted returns are not yet available for the first days of January in 1981 and 1982, the same results seem to have obtained; the advance/decline ratio on these dates was $NYSE_{1981}$ = 2.143, $AMEX_{1981}$ = 2.388, $NYSE_{1982}$ = 1.671, $AMEX_{1982}$ = 1.791.

This phenomenon was discovered by Donald Keim [1981], who reported that small firm returns during the month of January were significantly larger than large firm returns and that the difference was not as large during other months. Keim noted that January's returns were concentrated in the first few days of the month. Related results were reported by earlier scholars and by market professionals. A January abnormal return phenomenon was examined in a provocative paper by Branch [1977]. The market professional's viewpoint is illustrated by a study of the "year-end rally" in the annual *Stock Trader's Almanac*, Hirsch [1970, p. 105].[1] Although neither of these latter authors relate the turn-of-the-year effect to small firms, we shall see below that the two are closely connected.

The first thought of anyone brought up in the tradition of efficient markets is to ascribe such phenomena to a non-exploitable cause. Previously, I argued [1981] that the large average return difference between small and large firms found by Banz [1981] and Reinganum [1981] might be due to differences in risk; but risk alone is not likely to explain a return premium that is observed on the same date in *every* year. Even if part of the average return differential is a result of the greater riskiness of small firms, we cannot ascribe the behavior observed around the first of the year solely to this cause.

What then is responsible? In the sections below, I investigate a number of possible non-exploitable causes — and dismiss them for lack of supporting empirical evidence. A disturbing phenomenon for efficient markets theory will be reported: It may persist because of trading costs.

THE TURN-OF-THE-YEAR EFFECT

In the hope of discovering a seasonal effect on other dates that might suggest a cause of the January 1st effect, I calculated the mean difference in returns between an equally-weighted index and a value-weighted index for the first 20 trading days and the last 20 trading days of every calendar month between July 1962 and December 1980, inclusive (the CRSP availability period). The t-statistics for differences in return indicated that no period except the period around early January displayed an exceptional premium for small firms. There were occasional significant t-values scattered throughout the year, but that is to be anticipated even when there are no differences in expected returns between small and large firms.

The 5 largest daily mean return differences and the only daily differences in excess of 100% (annualized) occurred on 5 consecutive days: the last trading day of December and the first 4 trading days of

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1. Footnotes appear at the end of the article.

January. Mean return differences and their t-statistics are reported in Table 1 for these dates.[2]

TABLE 1

Mean Return Difference, Equally-Weighted (EW) Less Value-Weighted (VW) Index by Trading Day Around the First of the Year, 1963-1979

Last Trading Day of December	January Trading Day			
	First	Second	Third	Fourth
MEAN RETURN DIFFERENCE EW - VW, percent per day (t-statistic)				
.5647	1.186	.6067	.6107	.4527
(4.72)	(8.39)	(3.86)	(3.96)	(3.05)

The t-statistic is calculated from the standard deviation (across years) of the return difference on the trading day indicated. There were 19 December observations and 18 January observations. (The CRSP tape begins in July 1962 and ends in December 1980).

Later days in January also display significant small firm premia; during the next 10 trading days, t-statistics exceed 2.0 on 8 days. Nevertheless, no mean return difference on a later trading day in January is as large as the mean return differences on the first 4 days. As Table 1 shows, the very first day displays the largest difference of all.

The positive small firm return difference on the last day of December is unique. No other day in December displayed a large mean return difference. To my knowledge, this is the first time that a last-day-of-December small firm excess return has been documented.[3]

To put the turn-of-the-year effect into perspective, the average annual return differential between equally-weighted and value-weighted indices of NYSE and AMEX stocks was 9.31% for calendar years 1963-1980 inclusive. During those same years, the average return for the 5 days of the turn-of-the-year (last day of December and first 5 days of January) was 3.45%. Thus, about 37% of the entire yearly differential appears to occur during just 5 trading days; 67% of the annual differential occurs during the first 20 trading days of January (which is almost the whole month), plus the last day of December.

DISMISSAL OF SOME POSSIBLE SPURIOUS CAUSES OF THE TURN-OF-THE-YEAR EFFECT.

In searching for a non-exploitable cause of this unusual pattern, one might posit some peculiarity associated with year-end exchange trading or with data base construction around the calendar year end. Reasonable possibilities seemed to include:

a. Data base errors in CRSP might be associated with annual tape updating;
b. New listings might be concentrated at the first of the year and contain multi-day returns or an exceptional number of erroneous returns (because the pre-listing price was hard to find or could only be found on a distant date);
c. De-listings might be concentrated around the first of the year and be associated with multi-day returns (because distressed stocks trade infrequently), or
d. The mean returns might be polluted by a few securities which had "phony" transactions. For example, a closely-held firm might have a first-of-year price recorded for valuation or tax purposes. (Admittedly, there would seem to be little *a priori* reason for such events to display abnormally high returns).

In checking out the listing and de-listing possibilities, I had the number of such firms printed out by calendar date for every day covered in the CRSP data base. There was no discernible pattern for new listings. They occur uniformly over the calendar year, although there are more new listings during years with market upswings.

De-listings, however, occur more frequently near January 1. During several calendar years, there were 8 to 13 de-listings during the first week in January. This promised to be a solution to the puzzle, since the last return included by CRSP could be a post-de-listing return. CRSP explains that,

> when a security was de-listed, suspended, or halted, CRSP determined whether or not it would have been possible to trade at the last listed price. If no trade was possible, CRSP tried to find a subsequent quote for the security. If such a quote was available, CRSP used this quote to compute a return for the last period. . . . For a 'merger' event, ... the last . . . return . . . includes the distributed property . . . For a total liquidation event . . . the last . . . return includes the liquidation distributions and the 'final price.' CRSP [1979, p. 10].

To ascertain whether the CRSP treatment of de-listing (or of listing) is responsible for the turn-of-the-year effect, an equally-weighted index was constructed excluding such events. The index excluded the 5 daily returns prior to de-listing and the 5 returns just after listing of any stock. For good measure, I also excluded all multi-day returns.

The results were indistinguishable from those already reported. The small firm average premium actually increased slightly on the last day of December and on the first 4 days of January.

In checking for CRSP errors and for the possibility that a few outliers might be responsible for the results, the first step was to compute the percentage of firms with positive returns on the AMEX and NYSE during the turn-of-the-year, the last trading day of December through the fourth trading day of January. The results appear in Table 2. In most years, 12 out of 18, the frequency of positive returns was larger on the AMEX. The principal feature to notice about both NYSE and AMEX stocks, however, is that high average returns are closely associated with high frequencies of positive returns. That is, more than just a few stocks are causing high mean returns. These results

TABLE 2

Mean Returns and Frequency of Positive Returns During Turn-of-the-Year[a]

Year [b]	NYSE	AMEX	NYSE	AMEX	NYSE	AMEX
	NUMBER OF SECURITIES		PERCENT POSITIVE RETURN		MEAN % [c] RETURN	
1962	1142	842	86.5	82.9	4.46	6.54
1963	1140	787	74.8	74.7	2.78	5.75
1964	1174	815	72.7	74.6	2.20	4.76
1965	1192	825	64.0	66.2	1.63	3.40
1966	1225	851	81.1	77.8	3.91	6.52
1967	1207	843	56.8	60.6	1.50	3.72
1968	1190	845	20.1	26.4	-2.61	-2.64
1969	1228	866	73.6	83.0	3.78	9.34
1970	1296	949	68.0	74.8	2.46	6.08
1971	1336	1018	76.2	83.1	3.68	9.29
1972	1422	1052	75.4	79.4	3.05	6.39
1973	1480	1116	85.1	90.2	9.68	16.8
1974	1522	1074	93.0	90.5	16.9	19.1
1975	1515	1057	95.2	89.1	8.51	11.7
1976	1530	995	52.3	69.8	1.09	4.69
1977	1516	944	21.1	43.0	-2.63	.0665
1978	1526	865	90.1	85.9	5.96	8.11
1979	1504	812	43.3	55.8	.173	2.05

[a] The turn-of-the-year is defined as the last trading day of December and the first four trading days of January.

[b] Indicates the year for last trading day of December.

[c] Returns are for equally-weighted averages over the 5 trading days constituting the turn-of-the-year. They are not annualized. (Annualized returns would be approximately 52 times the numbers reported.)

To be included in the average, a stock must have had at least one recorded return during the just prior year — beginning with the sixth trading day of that year and ending with the sixth from last trading day of that year.

refute the outlier theory and suggest also that CRSP errors are probably not responsible for the results.

Just to check further on possible CRSP errors, I printed out the 25 largest returns on each January first and checked them in the financial press. No errors were found in CRSP. On the other hand, this checking did disclose an interesting fact: Most of the large turn-of-the-year returns were on extremely low-priced stocks, many of which were selling for less than \$2 a share. A typical price pattern was: \$1 per share on every day during the last 2 weeks of December, then an increase to 1⅛ on the last day of December (a daily return of 12½%), then another increase to 1⅜ on January 1 (a daily return of 22.2%). The price then stayed at 1⅜ for the rest of January. There was usually some trading volume every day. The low-priced stock effect corroborates the earlier results of Blume and Husic [1973], who seem to have been early observers of the phenomenon now known as the "small-firm effect."

The upshot of this checking was that *if* such low prices contain errors, the errors were not induced by CRSP's transcription from the financial press. Furthermore, the number of such events and the significant volume of trading make it unlikely that "phony" transaction prices are responsible.

AN INEFFICIENT MARKET PHENOMENON?

Perhaps there is some other non-exploitable explanation of these results. Since I could not think of one, it seemed worthwhile to consider the unthinkable — that the market was not removing an obvious seasonal regularity.

There is some suggestive supporting evidence in the form of market folklore about the "end-of-the-year rally." The *Los Angeles Times*, in commenting on the market's behavior on December 31, 1981, noted,

> The year-end rally many traders had been hoping for came late, and when it did appear, starting in Wednesday's [December 31] session, it was unimpressive (section IV, page 1, January 1, 1982).

It may have been "unimpressive" to the *Times* but the AMEX index return for the day was still 1.07% while the NYSE index return was .296%.

The year-end rally is supposedly a reaction to "tax selling" (see Branch [1977] and Keim [1981]). The argument goes as follows. There is downward price pressure on stocks that have already declined during the year, because investors sell them to realize capital losses. After the year's end, this price pressure is relieved and the returns during the next few days are large as those same stocks jump back up to their equilibrium values.

This argument is ridiculous, of course. If investors realized that such a pattern were persistent, they would bid up prices before the end of the year and there would be no significant positive returns after January first. But, the argument might counter, "There is indeed evidence of such speculative activity. Prices start rising on the last day of December!"

Although we might want to rebut with "Why not the next-to-last-day of December?", we are obliged to test every theory, even one so patently absurd as this, by the empirical strength of its predictions and not by its assumptions or even by its external logic. Accordingly, for each stock present on the last day of December in each calendar year, I computed the return during that year, excluding the first 5 and last 5 trading days (in order to excise the "year-end rally.") Then a second return was calculated for the stock over the 5 trading days from the last day of December through the first 4 trading days of January in the next calendar year. I then computed a cross-sectional regression between the two returns. Effectively, this tests a trading rule for selecting stocks at the end of December based upon their returns over the preceding year (there is no survivorship bias since the rule is not triggered until the last day of December).

If the tax selling pressure hypothesis is correct, there should be a negative relationship between the two returns; the results given in Table 3 are consistent with the hypothesis. For AMEX stocks, the regression coefficient is negative in every year and highly significant in all but 1 year of the 19.

For NYSE stocks, the negative coefficient is actually more significant in more years, 11 of 19, than the coefficient for AMEX listed stocks. This is not attributable entirely to the greater number of NYSE stocks in the cross-section; the correlation coefficient was also larger for NYSE issues in 7 of those 11 years.

Each year's regression was cross-sectional, so the observations are not independently distributed. To ascertain whether this may have resulted in an overstatement of the regression's significance, the cross-sectional coefficients were averaged over the 19 years and a standard error was computed from the 19 observations. Based on the assumption that the 19 observations constitute a random sample, a t-statistic to test for the significance of the mean coefficient was thereby obtained.

Here are the results. For the NYSE, I found $\hat{b} = -.0325$ and $t_b = -5.28$; for the AMEX, I found $\hat{b} = -.0640$ and $t_b = -4.41$. If there was any doubt from Table 3, this demonstrates that there is indeed a significant negative relationship between the turn-of-the-year return and the return over the preceding year.[4]

Eugene Fama pointed out that the slope coefficient in Table 3 could be interpreted as the fraction of the negative return during the previous year that is attributable solely to tax loss selling. A stock with losses has declined because of unfavorable information, but it might then decline even further due to tax selling. On average, there would be no rebound from the information, but there would be a full recovery from tax selling after the new year.

In addition to the cross-sectional negative relationship between the turn-of-the-year return and the previous year's return for individual stocks, there is a negative intertemporal correlation between mean returns. When the preceding year's average return has been lower, there is a greater reaction in the average during the turn-of-the-year. For NYSE issues, the simple correlation is $-.588$ between the mean return (equally-weighted) during the preceding year and the mean return during the subsequent turn-of-the-year. For AMEX issues the correlation is $-.169$. The simple linear intertemporal regression between mean returns is reported in Table 4.

Table 4 also reports the results when we limit the sample to stocks that had negative returns over the preceding year. If the tax selling hypothesis is correct, such stocks should have greater returns during the subsequent turn-of-the-year, because they represent securities with larger tax losses. Of course, tax loss selling would not be limited to such stocks. Others with positive returns over the entire year might still have had losses over holding periods shorter than a year or over longer holding periods.

Despite this caveat, the results in Table 4 show indeed that stocks with negative returns over the entire preceding year had higher returns around January 1. They display a stronger intertemporal correlation between mean returns. Again, AMEX stocks declined more than NYSE stocks within this group, and they rebounded more as well.

The year-by-year individual stock cross-sectional regressions analagous to those reported in Table 3, but limited to issues with negative returns over the preceding year, had negative and significant

TABLE 3

Cross-Sectional Regressions Predicting Turn-of-the-Year Return[a] by the Return Over the Preceding Year[b]

Preceding Year	NYSE	AMEX	NYSE	AMEX
	Regression[c] slope coefficient		t-statistic for Regression slope coefficient	
1962	-.0774	-.127	- 8.32	- 9.35
1963	-.0142	-.0450	- 2.75	- 6.16
1964	-.0221	-.0423	- 5.02	- 7.73
1965	-.0150	-.0142	- 4.93	- 3.90
1966	-.0731	-.0664	-12.5	- 8.24
1967	-.0186	-.00766	- 7.46	- 3.55
1968	-.0236	-.0139	- 8.53	- 6.46
1969	-.0962	-.127	-15.7	-14.5
1970	-.0482	-.0776	- 9.38	- 8.64
1971	-.0418	-.0969	- 9.41	-13.5
1972	-.0317	-.0568	- 6.86	- 9.35
1973	-.104	-.160	-10.6	- 9.66
1974	-.356	-.246	-19.4	-14.3
1975	-.0519	-.0355	-12.2	- 6.08
1976	-.00252	-.0227	- .651	- 3.99
1977	-.0341	-.0491	- 8.51	- 9.17
1978	-.0171	-.00735	- 3.92	- 1.26
1979	-.00171	-.0150	.561	- 2.91
1980	-.00472	-.00611	- 3.25	- 2.53

[a] For every year except 1980, the turn-of-the-year return, R_y, includes the last trading day in December and the first 4 trading days in the January immediately following. For 1980, only the last day in December is included, since the CRSP tape ends on that date.

[b] For every year except 1962, the preceding year's return, R_p, covers the entire year excluding the first 5 and last 5 trading days. For 1962, only the last half-year is on the CRSP tape, so R_p includes that half year excluding the last 5 trading days.

[c] The regression equation is $R_{yj} = \hat{a} + \hat{b}R_{pj}$, $j = 1, \ldots N$ where N is the number of stocks with available R_p's.

TABLE 4

The Intertemporal Relation Between Preceding-Year Mean Return[a] and Subsequent Turn-of-the-Year Return.[b] (N = 19 years, 1962-1980 inclusive)

SAMPLE	MEAN RETURN [c] (%) Preceding Year NYSE	AMEX	Turn-of-the-Year NYSE	AMEX	REGRESSION [d] SLOPE NYSE	AMEX	t-statistic for Regression Slope NYSE	AMEX
All Observations	10.7	14.3	3.55	6.46	-.118	-.0896	-3.00	-3.25
Stocks with Negative Returns During Preceding Year	-17.9	-25.1	4.92	8.58	-.335	-.310	-3.27	-3.28

[a] The preceding year's mean return, $\overline{R}_p$, is an equally-weighted average of all stocks listed during the year, excluding the first 5 and last 5 trading days. For 1962, only the last half-year was available.

[b] The turn-of-the-year mean return, $\overline{R}_y$, is an equally-weighted average of all stocks during the last day of December and the first 4 days of January. For 1980, only the last day in December was available.

[c] These are the grand means (over 19 years and over individual stocks).

[d] The regression was $\overline{R}_y = \hat{a} + \hat{b}\, R_p$.

coefficients in every year for both exchanges. The cross-sectional correlation coefficients were more negative in 11 of 19 years for the NYSE and in 10 of 19 years for the AMEX than the corresponding coefficients using all stocks (regardless of the preceding year's return). In contrast, when the cross-sectional regression was limited to issues with positive returns during the preceding year, the correlation was not as negative in any year as the correlation using all observations. Also, in 9 years (out of 19) for the NYSE and in 5 years for the AMEX, the intertemporal correlation was positive between mean returns.

A dissertation by Dyl [1973] (summarized in Dyl [1977]) examined the year-end pattern of prices and trading volume for a subset of NYSE issues. Dyl found that trading volume was abnormally high during December for stocks that had experienced large losses over the previous year. He found also that volume was abnormally low for stocks that had experienced large gains. This latter pattern was attributed to investors "locked in" by previous price appreciation and motivated to retain their shares until after the New Year in order to postpone taxes on realized gains. Some further evidence about investor timing of tax loss selling is presented in the appendix.

Dyl [1973] reports significant abnormal January returns for stocks that had experienced losses over the previous year (cf. Table 4.3, p. 74, where an abnormal return t-statistic of 5.58 is reported for the decile of lowest previous-year's-return stocks).

The apparent strength of the NYSE results found by Branch [1977] and Dyl and confirmed here raises a doubt that the year-end rally is really the source of the turn-of-the-year premium of small stocks. It might appear plausible that the year-end rally and the small-firm premium are distinct phenomena that just happen to manifest themselves during the same season. The next section examines this important question.

WHY DO SMALL FIRMS HAVE BIGGER YEAR-END RALLIES AND HIGHER AVERAGE RETURNS?

Two questions arise in connection with tax selling and the year-end rally as explanations of the small-firm effect. First, why do small firms have bigger year-end rallies? Second, why is the small-firm year-end rally not offset by price declines during the remainder of the year, thereby eliminating the long-term average return premium of small firms?

There may be a simple answer to the first question: small firms are more volatile than large firms. The cross-sectional distribution of observed returns has a larger variance. Since the average long-run (expected) return is positive, the greater variance implies that a small firm has a higher probability of achieving a negative return over a given period; i.e., it is a more likely candidate for tax loss selling.[5]

Small firms may have larger sales and earnings volatilities because they have fewer product lines and are less diversified. But whatever the source, the empirical evidence supports the observation that their returns *are* more volatile. During the 19 years on the CRSP tape, the cross-sectional standard deviation, $\hat{\sigma}$, of annual individual returns (excluding the first 5 and the last 5 trading days) was larger for AMEX than for NYSE issue in every year. The mean value of the ratio $\hat{\sigma}_{AMEX}/\hat{\sigma}_{NYSE}$ was 1.60, and the t-statistic of the difference between this ratio and unity was 6.70. In 14 of 19 years, the percentage of negative returns was also larger for the AMEX issues. The mean value of the difference in negative percentages (NYSE-AMEX) was −7.82, and its t-ratio was −3.31.

This evidence links tax loss selling to the small firm effect. Larger returns during the turn-of-the-year period accrue to small firms on average because they are more likely to have registered losses during the preceding year.

It is important to ascertain whether the entire turn-of-the-year return is caused by tax selling or whether smallness per se has an additional effect. If two different-sized stocks had declined by the same percentage amount over the preceding year, would their turn-of-the-year returns be equal or would the smaller firm have a higher return? I examined this possibility using a time series of pooled cross-sectional regressions. Both AMEX and NYSE issues were included in the same model. For each year, individual stock turn-of-the-year returns were regressed on their preceding year's returns plus an AMEX dummy. In all 19 years, the preceding year's return had a negative and significant coefficient. The least significant t-statistic was −2.47, and the average was −11.1. The time-averaged mean coefficient was −.0600 with a t-statistic of −3.68.

The AMEX dummy was included to measure the marginal effect of smallness in addition to the effect of tax selling induced by negative returns over the preceding year. The AMEX dummy had a positive coefficient every year and a very significant t-statistic in 17 of 19 years. The mean t-statistic was 8.14. The time-averaged mean coefficient was 2.66% with a t-statistic of 7.94.

The results suggest that smallness has an effect beyond that induced by higher volatility and concommitant tax selling, but there are reasons to hesitate before reaching a definite conclusion. First, since the preceding year's return is not a perfect indicator of tax selling, the regression is subject to an errors-in-variables problem that could have allowed the AMEX dummy to become spuriously important because it is a proxy for larger variance of returns. Second, the long-term mean returns of small firms may be higher because they are more risky. Third, higher transaction costs for small firms may allow a greater price effect from tax selling and a higher turn-of-the-year rebound. In the next section, I shall examine this last possibility in more detail.

Let us now turn to the second and more puzzling question asked above: Why are the large returns on small firms during the turn-of-the-year period not offset by lower returns during the rest of the year? In fact, they are not. Mean returns during periods *excluding* the turn-of-the-year are also higher for small firms. The average difference between AMEX and NYSE equally-weighted returns was 3.66% over the 19 CRSP sample years, excluding turn-of-the-year. Unlike the AMEX/NYSE return difference during the turns-of-the-year themselves, however, the t-statistic of the difference during the remainder of the year is only .614. Also, in 10 years of the 19, the NYSE actually had a higher return.

Perhaps posing the question above reflects my biases and training more than anything else. The question seemed to arise naturally because (one would think that) a high return in one calendar period must be offset by a low return in another *because mean returns are determined by risk* and an invariably positive excess return for a particular 5-day period certainly cannot be explained by risk.[6] Thus, there should be *some* period offsetting the turn-of-the-year returns. But if we are contemplating the possibility that markets are not efficient, we might as well contemplate the possibility that returns are not determined by risk. Bias, training, and even logic seem weak in the face of such a puzzling phenomenon.

It is still possible, of course, that the *long-term* average return premium of small firms *is* due to some type of risk, as yet unmeasured. The long-term premium accrues during two distinct calendar periods, a modest-sized and statistically insignificant premium over 50 weeks or so and a large premium around every New Year. Long-term investors would expect to receive both components. But why their total compensation should be divided into these two parts is a puzzle. The dichotomy seems to be evidence against the weak form of the efficient market hypothesis since the seasonal could be exploited to bring a risk-adjusted excess return.

CAN TRANSACTION COSTS EXPLAIN WHY THE TURN-OF-THE-YEAR PREMIUM IS NOT ELIMINATED?

Small firms are often firms with low prices and firms with low prices have large transaction costs. The normal bid/ask spread on small firms could conceivably preclude arbitrageurs from exploiting the turn-of-the-year pattern induced by tax selling. If the bid/ask spread on a low-priced stock were, say, 20% of the average transaction price, most of the tax sales near the year's end would be purchased by the specialist; the majority of transactions would occur near the low side of the bid/ask spread.

After the new year, the trading would revert to the normal pattern of a roughly equal number of buyers and sellers and an average transaction price close to the center of the bid/ask spread. Although the registered return across the turn-of-the-year would be positive, the arbitrageur could not exploit it, because he would have to buy at or near the specialist's ask price. The size of the average return over the turn-of-the-year is in a range that transaction costs could conceivably explain.

Trading costs cannot explain why the long-term average returns of small firms are so large: We still need risk for that. Nevertheless, they could explain why the small firm premium arrives in two distinct calendar periods and why that pattern has no tendency to disappear. Whether or not actual bid/ask spreads are sufficient to impede arbitrage requires (and merits) further study.

The transaction cost explanation may seem merely to push market inefficiency back one step. If the bid/ask spread is large, what is to prevent an arbitrageur from entering a limit order at or just an eighth above the specialist's bid? Then the next seller would sell to the arbitrageur, and the latter would eventually realize almost the full return that the specialist would have realized. The key point is that the usual bid/ask spread, which is determined by volatility and volume of trading during normal periods, does not apply when tax sellers are the predominant traders. Under these conditions, the spread should narrow as arbitrageurs compete for what they know confidently will be subsequent price increases. Of course, for low-priced securities, such a narrowing is limited to ⅛, the minimum possible spread.

There is also an information hindrance to such arbitrage. It may not be possible to tell for sure which issues are going to have the most tax sellers. Unless the stock is at its all-time low near the year's end, some holders will have unrealized gains. Of course, a stock that has had recent negative returns is more likely to have tax sellers — but their number would be uncertain and perhaps this risk, along with commissions, is sufficient to preclude full arbitrage.

In an attempt to investigate this question more fully, I tried a simple trading rule. The rule specified that purchases would be made of the first 10 (alphabetical) stocks on each exchange that achieved their annual low on the sixth from the last trading day.[7] The stock would then be purchased on the second from last trading day and sold at the close of the fourth trading day of the new year. Before transaction costs, this rule seemed to work very well indeed. For NYSE issues, the mean return over 18 years was 6.89% for 5 days (t-statistic =4.04), while for AMEX issues the mean return was 14.2% (t-statistic = 5.74). Note that the level of mean returns on both exchanges and the excess mean return of AMEX over NYSE are larger for this selected group of stocks than for all stocks.

It is difficult to obtain data on total trading costs. Phillips and Smith [1980, p. 185] report percentage spreads for NYSE issues that have options listed on the Chicago Board Options Exchange. The percentage spreads have a median of .56%, which is too small to explain the returns of 7% and 14% for the trading rule. On the other hand, stocks with listed options are the largest firms, and one would expect them to have very low transaction costs. Phillips and Smith report a mean percentage spread of 15% for listed puts; perhaps a listed put is an asset more similar in volume and in volatility to a small stock.

More comprehensive data on trading costs are reported in a recent paper by Stoll and Whaley [1982]. Dividing firms into 10 portfolios ranked by size, they found that the smallest-firm portfolio had an average bid/ask spread of 2.93% for 1960-79 and an average commission rate of 1.92%. The round-trip trading costs would thus amount to $2.93 + 2 \times 1.92 = 6.77\%$. The comparable figure for the largest firm portfolio was 2.57%.[8]

As a detailed example of the actual experience likely under a trading rule, Table 5 presents daily data for the 10 stocks chosen by the above rule at the end of 1978. This was a representative, recent, and slightly below median year for the trading rule, the average return being 3.94% for the NYSE and 10.3% for the AMEX. As Table 5 shows, the turn-of-the-year return for NYSE issues was positive for 9 of the 10 firms and zero for the other firm. One AMEX firm had a negative return. (See the next-to-last column, labelled "CRSP Turn-of-the-Year Five Day Return.")

Although bid/ask spreads are not available on days with transactions, information of a similar nature is impounded in the trading spread, the difference between the day's high and low transaction prices. If new information about a stock is equally likely to be favorable and unfavorable, the trading spread should be no larger than the specialist's spread.[9]

The last column of Table 5 reports the turn-of-the-year return if a speculator, following the trading rule, purchased at the high side of the spread on the next-to-last day of the year and sold at the low side of the spread on the fourth trading day of January. For NYSE issues, this reduced the mean return from 3.94% to 1.27%. If the trader were not an exchange member, commissions would still have to be deducted from the 1.27%. Although 1978 was a slightly below-average year, it would appear that no profit remains, at least for NYSE issues.

For AMEX issues, however, it might appear that the trading rule would still turn a profit. The mean return drops from 10.3% to 7.25% when the purchase and sale are at the high and low sides of the spread, respectively. A gross profit of 7.25% would still be larger than commissions. Yet, the data on volume of transactions, also given in Table 5, make it seem doubtful that the trading rule could actually be implemented. Notice that the volume is very low after the first of January for all 10 AMEX stocks. For 5 stocks out of 10, there is *zero* volume on the closing day of the rule. (When such an event occurs, CRSP reports a return equal to the average of the bid/ask spread). Even if a transaction had been initiated, there is no guarantee that it would have occurred at the specialist's quote. A small amount of speculation in such thinly-traded securities would probably affect the quoted prices. Nevertheless, an astute trader with a good floor broker might make a small profit in AMEX issues.

The pattern of trading volume on both exchanges is of some interest in its own right. Notice the dramatic fall in volume on January 2 for most issues. (Burlington Industries is an exception.) For low volume NYSE stocks and for all of the AMEX stocks, year-end tax selling is clearly revealed in the volume of trading.

RISK AND RETURN WITH SEASONAL DATA

If there is an annual seasonal in stock prices induced by tax selling and if transactions costs prevent artibrageurs from eliminating the seasonal, could sys-

TABLE 5

Trading Rule Results Using Stocks Which Achieved Year's Low on December 21, 1978

COMPANY	VOLUME (100 shares) Dec. '78 28	29	Jan. '79 2	3	4	5	BID/ASK OR TRADING SPREAD (1/8's) [a] Dec. '78 28	29	Jan. '79 2	3	4	5	CLOSING PRICE ($.1/8's) Dec. '78 28	29	Jan. '79 2	3	4	5	Turn-of-the-Year Five-Day Return [b] (%) CRSP	Trading
N Y S E																		Mean →	3.94	1.27
Allegheny Power Sys.	283	325	213	183	185	214	1	2	2	3	3	3	15.4	15.4	15.5	15.7	16.1	16.4	6.45	5.45
Armada Corp.	5	24	0	4	1	4	1	1	--	0	0	1	5 5.7	5.6	5.7	5.7	5.7	5 6.1	4.26	0.0
Asso.Dry Goods	180	154	155	207	374	227	4	3	5	2	5	3	16.5	16.3	16.7	16.7	17.4	17	2.26	2.26
Atlantic City Elec.	72	70	37	51	41	53	2	2	4	4	4	2	18.1 18	18	18.2	18.4	19	18.6 19	5.56	3.49
Becton Dickinson	317	387	64	67	29	191	5	7	5	5	4	6	31.7 31.4	31.2	31.5	32.1	32.4	32 32.4	3.18	.392
Bethlehem Steel	1821	1026	290	944	1249	1391	3	2	3	3	6	8	20.1 19.7	19.5	19.7	20	20.4	20.5 21.2	6.92	2.48
Brockway Glass	46	123	21	71	47	40	4	3	5	7	5	6	16.6 16.3	16.2	16.6	17.2	17.1	16.4 17	3.82	-1.49
Burlington Inds.	225	211	732	747	489	158	3	2	3	8	3	4	17.2 17	17	17.2	18	17.6	17.5 17.6	4.41	2.17
CP Natl.	20	26	6	11	12	16	3	2	1	1	1	1	14.7 14.6	14.5	14.7	15.1	15.2	15 15.1	2.54	.840
Certainteed	507	126	55	483	63	156	3	1	2	1	2	2	16.3 16	16	16	16	16	15.6 16	0.0	-3.82
A M E X																		Mean →	10.3	7.25
AAV COS	23	40	0	8	0	9	2	3	3	2	1	1	4 3.6	3.7	4.0[d]	4.2	4.1[d]	4.2	13.3	6.25
Automatic Radio Mfg.	42	61	17	2	10	5	1	1	2	0	0	0	2	2	2.3	2.3	2.2	2.3	18.75	18.75
Baker Michael	24	21	3	3	3	3	2	1	0	0	0	2	3.2	3.1	3.2	3.3	3.2	3.3	3.84	3.84
Baldwin Secs	5	0	0	0	2	7	0	2	2	2	0	1	6	6.2	6.1[d]	6.1[d]	6.2	6.4	8.33	8.33
Bethlehem	12	65	0	13	3	0	0	2	1	2	0	2	2	2	2.0½[d]	2.3	2.3	2.2 2.3[d]	18.75[c]	12.5
Bro Dart	18	33	2	0	11	8	1	2	0	1	0	0	3.2	3.4	3.3	3.2½[d]	3.2	3.2	0.0	-3.70
C.W. Trans	10	21	10	54	3	0	4	10	0	10	2	2	13	14.4	15.2	17.2	16.6	16.5 16.7[d]	29.8[c]	28.8
Chicago Rivet & Mach	15	19	2	0	0	0	3	4	1	3	3	3	21.4 20.6	21.4	21.5	21.5½[d]	21.5½[d]	21.4 21.5½[d]	4.52[c]	2.38
Connelly Containers	13	16	0	0	0	0	1	1	2	2	2	2	3.2	3	3.1[d]	3.1[d]	3.1[d]	3 3.1[d]	-3.85[c]	-7.69
Continental Matls	21	87	1	4	6	0	1	3	0	1	0	2	4.2 4.1	4.3	4.2	4.3	4.4	4.3 4.4[d]	9.09[c]	2.94

[a] The spread reported in 1/8$ is the difference between the High and Low transaction price on days with trading volume and the difference between ask and bid on days with no trading volume.

[b] The "CRSP" return is the return that would be computed with CRSP return tape data. The "Trading" return assumes that a purchase was made at the higher price of the spread and a sale made at the lower price. These latter prices are given above the reported closing price when they are different.

[c] Return is affected by the CRSP practice of using the bid/ask average.

[d] Average of bid/ask price.

tematic risk models still offer an explanation of the long-term mean return, i.e., could the capital asset pricing model's beta or the arbitrage pricing model's beta vector still be the only numbers necessary to explain expected return?

It might at first seem unlikely that these models would retain their exclusive explanatory power; we have already noted, for instance, that the total variance, systematic *and* non-systematic risk, is more closely associated with the probability of tax selling pressure and thus with the turn-of-the-year positive return than is systematic risk alone. Non-systematic variability helps explain the tax selling induced seasonality, but the question now is whether it helps explain long-term average returns.

From a long-term perspective, systematic risk could still be the only thing that matters. Of course, systematic risk *estimates* would be very biased with data more frequent than yearly, and measuring systematic risk would be difficult with annual data because of the paucity of observations. Nevertheless, if a good annual-based estimate were obtained, it might be sufficient to explain mean returns.

To see why this could be true, note that the annual seasonal is of no concern to any investor who measures his results over exactly a one-year period. The beginning and ending points of his year are irrelevant. His measurement period need not coincide with the peaks of the seasonal. He will not attempt to trade on the seasonal because of high transaction costs. He will not attempt to measure systematic risk with frequent data, because the seasonality will cause a downward bias in smaller or more volatile firms. He will, nevertheless, demand compensation for the contribution of each asset to the annual volatility of his diversified portfolio's return. The same argument is true for an investor whose holding period is random. Further investigation is required to determine whether an investor with, say, a monthly horizon would also be indifferent to the seasonality because of transaction costs.

In attempting to estimate long-term systematic risk, we should keep in mind that techniques such as Scholes/Williams' [1977] and Dimson's [1979] were not designed for coping with seasonality. Applied to daily or to monthly data, such techniques will not correct for the turn-of-the-year effect and will not produce betas that are unbiased estimates of true long-term betas. It would appear that the only technique currently available is the use of annual data. This will yield error-ridden estimates of systematic risk for individual securities but at least these errors can be diversified away in portfolios. Admittedly, estimates from annual data will provide poor ability to assess the effect of adding a particular asset to a portfolio.

SUMMARY AND CONCLUSION.

There is a striking annual pattern in stock returns. Around the turn of the year, average returns are high in general and the average returns of small firms are invariably greater than the average returns of large firms. The pattern cannot be explained by data errors, listings, de-listings, or outliers. Instead, it is closely associated with tax loss selling induced by negative returns over the previous year. Transaction costs and low liquidity probably prevent arbitrageurs from eliminating the return seasonality. The presence of the seasonality creates a substantial econometric problem in measuring systematic risk and in testing risk/return relationships.

APPENDIX

THE TIMING OF TAX LOSS SELLING AND ITS EFFECT ON RETURNS

There is one final topic to consider in connection with the tax loss selling hypothesis: If the turn-of-the-year return is really a rebound from tax selling, we should observe negative returns during late December when that selling is taking place. The Dyl [1973] evidence on trading volume seems to suggest that December selling *does* occur. Yet, December displays no significant return, either positive or negative, for any day other than the last day, and *its* return is significantly *positive*.

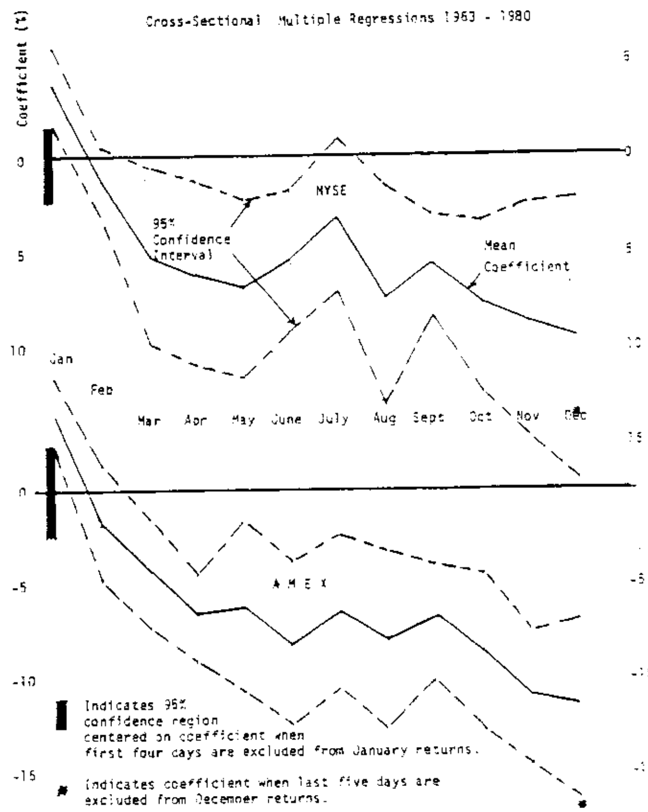
The absence of a significant December price decline might be explained as follows. When a particular stock declines during any earlier period (such a decline being caused initially by unfavorable news), a tax loss situation is created immediately for investors who have purchased at a higher price. The new lower price incorporates all information, including the information that some investors now expect a tax loss credit during the current year. This implies that December tax selling will be anticipated. In the absence of effective arbitrage, the price should decline immediately and remain depressed until the turn-of-the-year. No significant negative returns should be observed in December.

There is something of a puzzle in the large December volume of stocks with embedded losses. Investors have an incentive to realize losses immediately and not wait until December. The expected return is positive, so an embedded loss may be offset by the normal price rise before the year's end. Furthermore, a sale and repurchase initiates a new qualification period for favorable capital gains treatment.[10] This suggests that the earlier a price decline, the less tax selling will occur near the year's end. Both the normal positive return and exogenous purchases by non-arbitrageurs will dampen the effect of tax selling over time.

To test for such a pattern, a time series of individual stock cross-sectional *multiple* regressions was employed. In each of the 18 years, 1963-80, the turn-of-the-year return was regressed cross-sectionally on returns from all twelve of the preceding months. The multiple regression coefficients formed twelve different time series, one corresponding to each calendar month. The mean values and standard errors from these time series were used to construct Figure 1.

FIGURE 1

Turn-of-the-Year Return as a Function of Returns in each of the Twelve Preceding Months. Estimates of the Marginal Effect of Each Month as a Percentage of the Total Turn-of-the-Year Return: From a Time Series of Cross-Sectional Multiple Regressions 1963 - 1980



As the figure shows, there is a clear downward pattern; the largest negative effect on the turn-of-the-year return comes from the just-preceding December and the effect diminishes with more distant months. (Although the pattern is not strictly monotonic, the blips for July and September are not significant.)

Each month from March through December has a statistically significant negative impact. The t-statistics are all in the 3.0 to 6.0 range. February's effect, though still negative, would not be regarded as significant except at a low significance level.

Perhaps the most surprising effect is that of the preceding January. It is *positive* and highly significant, with t-statistics of 4.09 for the NYSE and 4.37 for the AMEX. This would seem to be evidence against tax loss selling and in favor of a simple annual (unexplained) seasonal. Consider, however, the following possibility: Since all stocks are volatile, every year every stock will bring a loss to some investors. Tax loss selling will therefore invariably occur to some extent. More volatile stocks should have more investors with tax losses because of larger and more frequent price declines, which are offset on average by larger and more frequent price increases. The most volatile stocks should experience greater tax loss selling every year. They should have larger turn-of-the-year rebounds every year as well. Thus, the turn-of-the-year return will be positively related cross-sectionally to the previous turn-of-the-year return. Since much of the January return occurs during the first few trading days, a positive impact will be observed for the January return on the following year's turn-of-the-year return.

Support for this argument shows up in Figure 1. The shaded bar at January is the 95% confidence region centered on the multiple regression coefficient obtained for January when the first four days of the year are excluded. The remaining days of January do not have a significant impact on the subsequent turn-of-the-year return.

The results of Figure 1 and the absence of statistically significant negative returns in December both suggest that investors do not wait until December for tax selling. The Dyl volume data, to the contrary, imply that at least some investors wait. This is also suggested by the volume data in Table 5. Perhaps transaction costs inhibit selling immediately after a loss and also make it difficult to detect the December price impact of those who wait.

In an attempt to detect late December selling with a test more powerful than simply averaging returns by trading day, I regressed the December returns (excluding the last day) cross-sectionally every year on the returns from each of the preceding 11 months. The multiple regression coefficients formed 11 time series that were tested for significant differences from zero. For both NYSE and AMEX, the averaged coefficients were positive for every month from January through October. Most of the AMEX t-statistics were above 2.0 and less than 3.0. For the NYSE, only 2 months had t-statistics above 1.6. (See Table 6.)

Significant positive coefficients are to be expected if the loss experienced in an earlier month induces tax selling in December. Thus, the results support the view that some investors wait before realizing losses and that their actions have an impact on December prices, probably resulting in more trades at the bid. There is, unfortunately, another reason why these coefficients could be positive. Since expected returns differ across stocks, cross-sectional rankings of returns will tend to persist. The results using November's rather than December's return as dependent variable (see Table 6) favor the expected return explanation.[11]

The regressions just described produced yet another anomaly. Although returns from January through October displayed the anticipated positive coefficients, the return from November had a *negative* and significant effect on December's return. The t-statistic for its mean coefficient was −2.76 for the NYSE and −2.38 for the AMEX. This result cannot be attributed to tax selling, since it would imply that

TABLE 6

T-Statistics of Mean Regression Coefficients From Time Series of Cross-Sectional Multiple Regressions, December and November Returns On Returns in Preceding Months, 1963-80.

Month of Independent Variable's Return	NYSE		AMEX	
	Month of Dependent Variable's Return			
	December	November	December	November
January	.987	1.38	1.96	1.39
February	1.55	2.44	1.84	2.54
March	1.53	1.76	2.69	2.33
April	1.07	2.97	3.42	6.01
May	1.26	.948	2.33	1.87
June	.650	2.50	2.85	3.44
July	1.49	1.39	2.25	4.52
August	1.30	1.43	2.73	3.13
September	1.08	1.35	2.35	.956
October	.233	-2.54	2.05	-3.18
November	-2.76		-2.38	

November losses induce December purchases. David Mayers suggested that the anomaly might be due to some stocks selling at the bid price and others at the asked price on the last trade of November. Since the ending November price is in the numerator of November's return and the denominator of December's return, an "error-in-the-variable" is included in both returns but with an opposite sign. I tested this in two ways. First I computed the correlation between November's and October's return, where it was negative and significant; next I excluded the last day of November from November's return. This reduced drastically the AMEX' negative November effect; its t-statistic was brought down to −1.07. However, the NYSE data still produced a t-statistic of −2.03.

In a small supplemental experiment using data from 1980, the first 200 stocks present on the CRSP tape were used to calculate cross-sectional correlation coefficients for various lags. For example, returns on the first trading day of the year were correlated cross-sectionally with the returns on the second day. The second day's returns were correlated cross-sectionally with day three, and so on for each successive pair of days. The resulting coefficients were averaged intertemporally. Based on the null hypothesis of zero intertemporal dependence, a t-statistic was computed for the time series mean of the cross-sectional coefficients. A similar operation was performed for longer lags between successive cross-sections.

Mean correlation coefficients for the first five lags were all negative and had t-statistics of −8.42, −2.76, −4.34, −1.82, −1.19, respectively. Further lags were mixed in sign and were insignificant.

[11] In Hirsch's 1982 edition of the *Stock Trader's Almanac*, the "year-end rally" has been dropped as a topic. The 1970 edition alleged, incorrectly it would seem, that the "year-end rally is dead" because "the market always tends to discount the obvious" (p. 105). The 1982 edition still notes that January has the highest returns of any month. See "The Best Months of the Year" (p. 121). Hirsch's *Almanac* is a treasury of testable trading patterns. For instance, the weekly seasonal, high returns on Friday and negative returns on Monday, investigated by French [1980], was reported in the 1970 edition (p. 119) and updated with little apparent change in the 1982 edition (p. 118).

[2] It was noted above that the return difference between equally-weighted and value-weighted indices is positive on the first trading day of January in all 18 years on the CRSP tapes. The other trading dates were nearly as strong. The last December trading day displayed 17 of 19 positive return differences. The second through fourth trading days in January displayed 17, 17, and 15 positive differences, respectively, out of 18.

[3] In a private communication, Donald Keim reported finding this December anomaly too.

[4] The regression specification was checked also by sorting the independent variable, the preceding year's return and computing the Durbin-Watson statistic. It was near 2.0 in every year. Normal probability plots of the residuals indicated the usual thick tails but nothing else exceptional.

[5] For this argument to be correct, the variability of returns has to more than offset the higher mean return of small firms. That is, if μ_L and μ_S are the expected returns of large and small firms, σ_L and σ_S are their standard deviations, and z is a standardized random variate, we require

$$P(\mu_S + \sigma_S \tilde{z} < 0) > P(\mu_L + \sigma_L \tilde{z} < 0).$$

Given the extremely large volatilities of individuals stocks, it seems likely that this condition is satisfied.

[6] Notice that "risk" was used here without specification. Regardless of whether the risk is systematic or idiosyncratic or whether the capital asset pricing model, arbitrage model, or some other model is supposed to portray risk, no risk parameter can explain the turn-of-the-year phenomenon.

[7] The sixth from the last trading day was selected to be consistent with previous results reported in this paper, which generally excluded the first and last 5 trading days of each "previous" year. The number of securities was limited to 10 on the grounds that an actual speculator could easily handle 10 issues. Not every year had 10 securities that achieved their yearly low on the sixth from last trading day. On the AMEX, the minimum number was 5 over the 18 years. On the NYSE, the minimum number was 7 for the years included but there were 2 years in which no stock qualified. No other trading rule was tried.

[8] There is a possible problem with the Stoll/Whaley data in the context of the turn-of-the-year phenomenon. Stoll and Whaley collected bid/ask spreads only on the last trading day of the year. If the spread is narrowed during that period by arbitrageurs attempting to exploit the turn-of-the-year effect, the actual trading costs on the selling date, after the New Year, will be higher than the Stoll/Whaley figure.

[9] The bid/ask spreads in Table 5 for days with no trading volume are often larger than the trading spreads. This may be due to the well-known phenomenon of trading within the quoted spread.

[10] For example, suppose on July 1 that a long-term investor expects a 20% annual return but owns a stock that has declined by 10% since it was purchased 6 months ago. If the investor sells now, realizes the loss, and repurchases a similar stock (he has to wait 30 days to repurchase the identical stock, according to law, or else he forfeits the tax loss credit), he will have an expected tax liability of $20(\tau/2) - 10\tau = 0$, as of next July 1, ignoring the timing difference between the loss and capital gain and assuming a capital gains tax rate one-half the ordinary rate τ. If he waits, intending to sell at the year's end, the current embedded tax loss will be wiped out by December due to the expected price rise; his tax liability next July will be $(20 - 10)(\tau/2) = 5\tau > 0$.

A recent paper by Constantinides [1982] analyses this issue much more rigorously. Constantinides derives the optimal strategy for realizing capital gains and losses without transaction costs; it is to realize losses immediately and to defer the realization of gains until liquidation is "forced," (by, say, the necessity to consume). Transaction costs would undoubtedly delay the optimal realization of losses and result in a policy wherein the probability of loss realization increases as the tax year nears its end.

[11] In what turned out to be a naive attempt to expunge the expected returns from the data, all the individual security returns were "de-meaned" by subtracting the sample mean computed from the available observations. This left the basic pattern in Table 6 virtually unchanged, although the specific numbers shifted somewhat among months. Since the November dependent variable still had a positive relation to previous months (except October), apparently the subtraction of the expected return was offset by the addition of the error in the sample mean. (Note that the latter addition will, *ceteris paribus*, increase the cross-sectional correlation.)

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