# Explaining the January Small Firm Effect by the Interaction of Procedurally Rational Investors and Seasonal Traders

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**Abstract**

The magnitude (but not the existence) of January excess returns on small and low priced stocks is explained by the determinants of the minimum profitable trade for those trading against a seasonal rather than by size-related differentials in the strength of the January demand/supply shift. A greater seasonal price change on small, low priced, and neglected stocks can persist without inducing seasonal traders (arbitrageurs) to trade against it. The argument applies also to monthly and weekly effects. A procedural rationality argument depending on holiday time pressure may explain the January demand/supply shift.

## Introduction

A major anomaly recently has attracted much interest. Numerous researchers report that stocks and bonds of small firms have extremely high January returns, especially during the first five trading days. Roll [51] documents that the unusually high returns also occur on the last trading day of December; this will be referred to as the *turn-of-the-year effect*. No satisfactory explanation has been offered.

Lakonishok and Smidt [32, 33] examine the potential profits from 1970 to 1981 obtainable by someone who bought the entire volume of stocks traded on the next-to-last day of the year with at least two transactions that day and sold on or after the fifth trading day of January for the stocks in the smallest decile (by trading volume, a criterion closely related to market capitalization) of all stocks on the New York Stock Exchange (NYSE) and the American Stock Exchange (ASE). The calculated return potential was 16.4 percent. This is not an annual rate of return, but a percentage return over about a week.

The turn-of-the-year effect will be interpreted as evidence of a shift in the demand and supply for stocks occurring around the turn of the year. Evidence that such a shift occurs will be presented with a possible hypothesis to explain it. Even if such a shift in the net demand for stocks occurs around the turn of the year, there remains the question of why the effect appears to be so much stronger for small capitalization, low priced, illiquid stocks. The prevailing hypothesis appears to be that the strength of the demand shift is stronger for small than for large firms.


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An alternative hypothesis is that the size-related variation of the effect is caused by differences in the ability of seasonal arbitrageurs and market makers to arbitrage the differences. High spreads, commissions, and asymmetric information-related obstacles to arbitrage cause the minimum seasonal price change that can survive trading by seasonal arbitrageurs to be larger as a percentage of value for small capitalization, illiquid, neglected firms. (These categories heavily overlap.)

### Tax-Related Selling

The most widely discussed reason for turn-of-the-year effect in the U.S. is year-end tax selling. Several authors (McEnally [39], Branch [7], Givoly and Ovadia [18], Roll [51]) document that the stocks that dropped most in the previous year rebounded most in early January. Jacobs and Levy [25], using a multivariate model that controls for most variables, show that separate measures of short-and long-term tax selling are statistically significant in explaining January returns for 1978-1986. Zivney and Thompson [69] show that a relative price measure (current price relative to historic prices) shows a strong January effect and that this effect can explain the firm size effect. This is consistent with a tax-related explanation for the small firm January effect.

December tax-loss selling is well documented. Slemrod [60], using a sample of 1962 and 1973 tax returns (that includes all individuals with over $200,000 income in 1973 and that accounts for about three-quarters of the capital gains reported) shows that the ratio of gross losses realized to total sales is unusually high in December and that the effect is statistically significant. The effect is shown to be strongest for high income individuals (and in the opposite direction for those with negative incomes), as theory would predict. It also appears the ratio of gross gains to value of stock sales is highest in January, suggesting some postponement of sales of stocks with gains until the new tax year. In addition, Dyl [15] and Lakonishok and Smidt [32, 33] document that stocks that have fallen are sold in higher volume near the end of the year.

Using tax-loss selling to help explain the January small firm effect appears plausible. Reinganum [47, 48] documents that 60 percent of the firms in the smallest size decile were also in the quartile with the strongest incentive for tax-loss selling. Chan [9] finds similar results, but does not interpret them as consistent with fully rational (substantive rationality) tax-loss selling. Reinganum, however, finds that tax-loss selling does not explain the January small firm effect fully. In particular, tax-loss selling does not explain why the January return is greatest for the smaller firms among those that are logical tax-loss selling candidates.

Ritter and Chopra [50] show that for 1935-1986 the lowest capitalization quintile of NYSE stocks that had positive returns in the prior calendar year (poor candidates for tax-loss selling) had returns in January that ranged from 6.18 percent for low beta stocks to 8.49 percent for high beta ones, returns well above the roughly 1 percent returns for average stocks in average months, although below the even higher returns of 9.76 percent to 12.82 percent for those that had negative or zero returns in the prior year.

In the traditional efficient markets paradigm, tax-loss selling should not be followed by abnormal returns because the optimal strategy for most sellers is to reinvest the funds promptly (Brown, Keim, Kleidon, Marsh [8]). If this is done, the tax-loss selling is offset by buying--the demand curve for stocks does not shift. As Constantinides [11, p. 85] observes, "Rational tax-loss sellers should repurchase different stocks sold by other tax-loss sellers at about the same time." His use of the word rational is substantive rationality (defined and discussed below), with no consideration of the costs of decision making.

Perhaps the strongest argument against the year-end effect caused by tax-loss selling is provided by the 1986/1987 turn of the year, when the tax laws provided a strong incentive to retain losers and sell winners, behavior opposite that usually encouraged. In spite of the reversal in tax incentives, there was no reversal of the usual pattern of stocks that hit new lows at year-end having abnormally high returns in January of the next year (Miller, Hill, Lajaunie, and Sundar [45]). This suggests that the abnormal turn-of-the-year small stock effect is not primarily a tax effect.

### A Holiday Effect?

In most countries the tax year begins in January and tax-loss selling predicts what is observed, a January effect. There are countries where the tax year ends at another time (Britain, Australia), however, that have a January effect (Gultekin and Gultekin [20]). In Australia there appears to be not only a July seasonal following the June 30 end of the tax year, but also a January effect (Brown *et al* [8]). In Canada before 1973, there was no capital gains tax, but there was a turn-of-the-year effect (Berges *et al.* [6], Tinic, Barone-Adesi, and West [67]). Kato and Schallheim [26] argue that the Japanese tax law should not produce a January seasonal. They show, however, that one exists. Pettengill [46] shows that a January effect existed in the U.S. before it had an income tax. Lee and Chang [35] show that there is a January effect in the Korean stock market even though there is no individual capital gains tax and trading is not permitted by foreigners, thereby preventing effects from foreign capital gains taxes. These studies suggest that there is an additional factor explaining the January seasonal, one

that can explain the January effect in countries without a tax year coinciding with the calendar year.

One possible candidate is investors shifting from less risky positions near the end of the performance measuring period (in order to avoid slipping further in the rankings) to more risky positions at the start of the next performance measurement period (in order to outperform the averages), as Haugen and Lakonishok [23] discuss. Institutions trying to eliminate embarrassing losers from their year-end list of holdings could produce heavy selling of stocks that have experienced losses. This would resemble tax-loss selling in its effects.

A possible explanation that has not been discussed in the literature is the fact that the year-end follows the Christmas holidays. How could the holiday celebrations lead to a January price surge? The holidays are traditionally a busy time. Gifts are bought, parties attended, relatives visited, etc. The opportunity cost of time is unusually high. What can be postponed is postponed. One item that is postponed is investment decision making.

It is hypothesized that deciding which stock to purchase frequently is postponed by individual investors. The result is that the normal lag from sale to reinvestment lengthens. Although the number of working hours required to reach a decision may not change, the ratio of time for investment decision making to calendar time elapsed decreases, increasing the lags expressed in calendar time.

Some decisions to sell also are postponed. Because the typical individual has only a few stocks (with which the individual is already familiar, having received quarterly and annual reports), there are only a few candidates for sale. Decisions to sell often can be reached quickly, especially if a decision is forced by a need for funds, a need to record a tax loss, or an unfavorable development in a particular security. In contrast, there are usually several candidates for purchase, making the total number of securities to be examined a multiple of that required for sell decisions. The investor may not have all the relevant information about these securities. The result is that when the opportunity cost of time is unusually high, buying decisions are more likely to be postponed than selling decisions, creating a net imbalance during a period when time's opportunity cost is high.

After the holidays, things return to normal. In early January the decisions on what to purchase are made and orders placed. This explains the January price surge.[1]

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[1]The mechanism described above would produce above average orders from individuals early in January for most stocks, but especially would affect the smaller stocks (where investors often do their own research and postpone decision making until they find time for the required research).

This model predicts that there will be a turn-of-the-year effect in countries celebrating Christmas. Because most developed countries celebrate Christmas (including Japan, Singapore, and Korea, to mention non-Christian countries reported to have a January effect), it is difficult to separate the holiday time pressure effect from other possible explanations for an end-of-year effect. The theory is supported by one interesting exception; Gultekin and Gultekin [20, p. 476, note 9] report that Israel's stock market lacks a January effect.

### Procedural Versus Substantive Rationality

Some readers may protest that investors delaying investment of their funds until after the holiday period involves irrational behavior. Such behavior is irrational only if the idea of rationality is what Simon [56, 57, 58, 59] has called *substantive rationality*. This is the idea that individuals always succeed in finding the optimal solution to their problem, given their objective function and the available information. Simon points out how the brain's limited data-processing power makes finding the absolute maximum difficult or impossible. Instead, individuals use simple heuristics and decision rules to find satisfactory solutions. Simon calls the use of such decision rules *procedural rationality*.

The explanation of this paper involves procedural rationality, with most investors following the procedurally rational rule (especially for the investor not aware of the turn-of-the year effect) of placing investment orders as soon as practical after decisions are made and not deciding to buy when the demand for time for other purposes prevents acquiring the required information or giving adequate thought to the problem.

Procedural rationality implies not starting the decision process on investment of funds (including those from previous stock sales) until the funds have been received because the exact amount and timing of the funds receipt is not known earlier. Investors do not wish to spend valuable time deciding how to invest a particular sum on a particular date only to discover that the funds are not yet available or that they differ in amount from what was anticipated. Modern portfolio theory advocates evaluating securities in the light of their covariances with other securities owned. It is not known what the other holdings will be until the sell decisions have been made.

The above argument explains why it is procedurally rational for those selling stocks for tax reasons not to purchase replacement stocks until after the passage of a period for study, evaluation, and decision making. This procedurally rational delay often causes the reinvestment of the proceeds from

end-of-year sales to occur in January (what for tax sales Ritter calls *parking the proceeds.*)[2]

Evidence exists that stock sales often are not followed by immediate reinvestment, leading to a decline in that investor's stock ownership. Feldstein and Yitzhaki [16, p. 20] report that only 58 percent of the dollar value of common stock sales in 1963 appeared to have been reinvested in other common stocks within the same year.[3]

Admittedly, delaying a purchase from December to January may have a high cost in sacrificed return, but how high this cost is only recently was reported in the literature. The data documenting the January effect come predominantly from a time before the effect was known. It was not rational for an individual investor to make computer runs (remembering that only recently has cheap computing become available) and search for seasonal effects, when the investor had the advice of qualified professionals (and the reasonable sounding random walk theory) that no seasonal effects will be found. With substantive rationality, the individual already knows the results of all possible computer studies and would be expected to act in accordance with any information such studies would reveal.

Procedural rationality implies, for example, not taking valuable time to formulate an opinion about whether a particular stock is a bargain at $1.00 (when it would not be at 1 1/8) unless one has funds to invest and has decided to take time from other activities in order to select a security for purchase. Of course, there are always a few investors with opinions on fair values for securities. It is their buying (with that by market makers and seasonal traders) that keeps the price from falling to zero when the general public wishes to do more selling than buying at a particular price.

### Evidence for a Turn-of-the-Year Demand/Supply Shift

The above theory attempts to explain the existence (but not the magnitude) of the turn-of-the-year effect by more net public buying in early January than during the holidays. There are several significant studies showing such a shift occurs. Lakonishok and Smidt [31] devise and employ a test based on the

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[2]Ritter explains the January excess returns on small firms by individuals preferring such stocks, while this paper explains them by the greater obstacles to seasonal arbitrage for low priced stocks.

[3]A referee has pointed out that sales of stock in order to make a major purchase, such as a house, may be followed by reinvestment of the proceeds by the recipient of the funds, such as the seller of the house. There likely would be a delay before the reinvestment, however, and it is plausible that this delay might be longer for stock sales around the holidays than at other times.

closing ratio (the close minus the low divided by the high minus the low) to determine whether most transactions on a particular day are initiated by the buyer or the seller. Their data show a shift near the end of the year from trades initiated by sellers to trades initiated by buyers. Keim [28] shows that for over-the-counter stocks, there is a shift from most closing trades at the bid price (seller initiated) to most at the ask price (buyer initiated), causing the closing transaction to transaction return data to significantly overstate the change in true returns caused by the demand supply shift.

Rozeff [54] shows that there is net selling by the public in December and net buying in January. Specialists and other NYSE firms are net buyers in December and net sellers in January.

Ritter [49], using daily data on buying by Merrill Lynch customers, finds a major turn-of-the-year decrease in net individual selling. Furthermore, he shows that the magnitude of the January small stock effect has a statistically significant correlation with the increase in the buying-to-selling ratio. This is evidence for a fundamental shift at the turn of the year between net selling and net buying by the general public.

How could a supply/demand balance shift at the end of the year lead to a price shift that is largest in percentage terms for small, low priced, illiquid stocks neglected by analysts?

### Why Marginal Traders Do Not Eliminate the Small Firm Effect

Any theory that attempts to explain the year-end small firm effect by the behavior of the typical or representative investors has to explain why a small number of informed investors do not trade profitably against those investors whose behavior is creating the effect and thereby eliminate the effect. It can be argued that the marginal investor sets the price. The marginal investor may be well informed even when the typical investor is not. (For more on the role of the marginal investor, see Miller [40, 43].) Thus, trading by well-informed marginal investors cannot eliminate a seasonal small firm effect that otherwise would exist.

Low capitalization stocks are predominantly low priced stocks. The size effect has been argued to be primarily a price effect (Kross [30]). Commissions and spreads as a percentage of value are highest for low priced stocks and thus are a larger obstacle to arbitrage for small stocks. Loeb [36], Stoll and Whaley [61], Schultz [55], and Lakonishok and Smidt [32, 33] all document that small firm stocks have higher commissions and higher bid/ask spreads. Keim [28] reports an average spread of 15.39 percent of the bid price for the bottom decile of all stocks.

With price quotations typically in eighths of a dollar, price discreteness implies large spreads for many of the low priced stocks that experience a large turn-of-the-year effect. Reinganum [48, p. 103] reports that the average price was slightly less than one dollar for the category of firms that provided the best January returns (quartile with the largest short-term tax losses and bottom decile by capitalization).

As large as the January effect is in terms of annualized percentage rates of return, it is small in absolute terms. The specialist's (or other market maker's) spread is a large fraction of the potential profit, frequently as large as the potential profit. Consider the case where the stock is expected to shift from 1 to 1 1/4 in late December to 1 1/4 to 1 1/2 after the turn of the year, almost a 25 percent gain. The effect cannot be exploited by market orders, as purchases typically would be from the specialist at his then ask of 1 1/4 followed by later sales to the specialist at his then bid of 1 1/4, an expected zero precommission profit and a postcommission loss. The turn-of-the-year effect contains a disproportionately large number of such cases. This leads Roll [51] and Lakonishok and Smidt [32] to suggest that the effect may not be exploitable. Lamoureaux and Sanger [34] show that the bid/ask spread prevents traders from exploiting the effect in the over-the-counter market.

Thus, informed marginal traders using market orders could not reduce a seasonal to zero. If the only one able to trade against a seasonal without using market orders was the specialist, the seasonal would not be eliminated. Because a specialist is a monopolist, he would set the spread to maximize profits (subject to regulatory requirements), and his trading should not be expected to eliminate a seasonal. The inability of the informed marginal traders to eliminate a seasonal using market orders does not imply their trading cannot eliminate seasonals. They can use limit orders. Thus, the profitability of trading against seasonals with limit orders must be considered.

### Trading with Inadequate Information

Part of the problem created by the large specialist's spread on low priced stocks can be avoided using limit orders to acquire and liquidate positions. There is one major risk to attempting to make a market maker's profit through trading with limit orders. Someone who knows something you do not may choose to trade against you. A partial solution (partial because it does not deal with true insiders) would be for the trader to be aware of all information regarding the stocks traded. Efficient market theory is a theory of substantive rationality in which all traders make their decisions in the light of all available public information.

It is not procedurally rational, however, for a seasonal trader to obtain and process this much information (even if it were all in the public domain). Lakonishok and Smidt [32, Table 4] estimate the potential profits to be only $298 per stock after paying the spread. This is inadequate to cover the costs of obtaining and analyzing the publicly available information about the stock traded at year-end.

Likewise, Reinganum [47, 48] reports that at the end of 1974, there were 171 stocks in the group most likely to go up in the next few days, those both in the smallest decile by size and in the top quartile for tax-loss selling potential. These stocks experienced a one week return of 27 percent (not an annual return of 27 percent, but this much in a single week). The entire volume traded on the last day of January, however, totaled only $518,062 or an average of about $3000 per issue. This is about the cost of a used car. It would be unreasonable to spend more researching the stock than is usually spent researching a used car. The profit potential per issue was only $833.

In this context, it must be remembered that heavy expenses for staff or computer programs may result in idle capacity the rest of the year. The trader faces the technical problem that year-end comes but once per year.

Thus, it appears that even with some informed marginal traders using limit orders, a small seasonal fluctuation in price whose size is of the magnitude of the bid/ask spread could persist. The idea that transactions cost including bid/ask spreads may explain the persistence of a small seasonal seems implicit in earlier writings. A logical extension has not been made. This is that the empirical regularities in the magnitude of the seasonality may be explained by differences between securities in the size of the seasonal price effect that can survive in the presence of well-informed seasonal traders (who may be the marginal investors here).

## Explaining the Magnitude of the Seasonal by Limits on Arbitrage

How the magnitude of a seasonal is determined by the willingness to trade of the marginal investor is illustrated in Figure 1. The solid line is the path prices would follow if there were no trading against the seasonal (seasonal trading). Net December selling is followed by January buying. Without seasonal traders, prices would follow the solid line, with market-clearing prices much lower in December than in January. This creates an opportunity for profitable short-term trading. This is recognized by the seasonal traders. They buy at the lower limit (the marked heavy dark line on the diagram) in December and sell later, probably in January. At the turn of the year, prices shift rapidly from the lower limit to the upper limit, creating high percentage rates of return.

In symbols, it is assumed that there are periodic demand and supply fluctuations that would cause shifts $d_i$ in the prices of stocks in group i (based on size, price, etc.) Traders aware of these shifts only will trade against them if there is a price change (plus dividend income and minus the opportunity cost of funds) of at least $c_i$. Whenever periodic demand/supply shifts occur, the price shifts by the less of $c_i$ or $d_i$. The hypothesis underlying this paper is that the constraint on price changes set by the seasonal traders of $c_i$ regularly proves binding. The result is that the magnitude (but not the existence) of seasonal price changes is explained by the determinants of the minimum profitable seasonal trade rather than by the strength of the forces causing the change. The turn-of-the-year size and price effects are due to the greater spreads required by seasonal traders (arbitrageurs) for small and low priced stocks.

The key difference between this model and many of the models in the literature is that most discussions implicitly assume that the same factors that cause the periodic price fluctuations to emerge also determine which securities will show the most extreme fluctuations. To understand why small capitalization stocks (or any other type of security) undergo a greater seasonal fluctuation, one asks not merely whether there is any reason for their demand/supply fluctuations to be greater, but whether there is any reason for the arbitrage process to be less effective. The size effect does not require a seasonal variation in the spread applicable to stocks of a particular size or price, but merely that the spread vary with size or price.

In essence, the percentage price discrepancy required to induce trading is greatest for low priced, small, and neglected stocks. This explains why these stocks experience above average returns during any periodic demand/supply imbalances.

## The Seasonal Trader as a Market Maker

Those using limit orders to acquire a position at year-end with the intention of liquidating their position in January are acting as market makers and can be analyzed with the well-developed theory applicable to such market makers (see Bagehot [4], Garbade [17], Copeland and Galai [13], Treynor [68], Glosten and Milgroam [19]). In essence, market makers must make enough profits from those trading for liquidity reasons (and for tax reasons) to cover losses expected from trading with those having superior information. Because it is not procedurally rational for those trading against the year-end effect to be substantively rational (i.e., to be fully informed), these traders rationally must anticipate many trades with better informed traders. They must benefit from reasonably large spreads for their trading to be profitable. The theory of market making with less than perfect information shows that the worse the information

possessed by the market maker (what a seasonal trader is here), the higher the spreads should be (Bagehot [4]).

For smaller firms, the potential profits (in total, not as a percentage) from trading against a seasonal are less. The amount of information economical for seasonal traders to acquire is also less. Analysts and other outside sources (financial publications, brokerage houses, newsletters) find it uneconomical to provide information on small firms. The seasonal traders, aware that they are at an informational disadvantage, require a higher minimum spread before trading against a seasonal. A reasonable surrogate for the availability of information is the extent to which a stock is followed by analysts, with the returns on the stocks less followed by analysts predicted to display more seasonality than the widely followed stocks. Such a pattern is found by Arbel [2].[4]

The seasonality in the returns to small firms also may be explained by differences in information because the degree of certainty appears to be correlated closely with firm size. Arbel's data show a significant correlation between size and disagreement among analysts about a company's earnings. The greater turn-of-the-year effect on small firms could be explained by the greater risk of trading on poor information.

### Seasonality in Apparent Risk Premiums

Perhaps the most interesting of the January effects is the discovery by Tinic and West [65] for the U.S. and Tinic and Barone-Adesi [66] for Canada that the positive relationship between systematic risk and return predicted by the capital asset pricing model appears to hold only in January, a result for which they offer no explanation. Corhay, Hawawini, and Michel [14] confirm the January seasonality in the risk premium for the U.S. and find evidence of seasonality in the risk premium for the United Kingdom and Belgium. Gultekin and Gultekin [21] show that empirical estimates of arbitrage theory factors are priced only in January.

Risk premium seasonality can be explained by the mechanism used to explain the small firm January effect. In certain months, many stocks move from the lower limit (where their prices are supported by informed investors) to the upper limit. How big a move they experience depends on how far apart these limits are. If the distance between the limits is greater for the high beta stocks than for the low beta stocks, the result will be a high cross-sectional correlation between beta and stock returns.

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[4]This interpretation is different from that of Arbel (p. 10) who tries to explain the seasonality in prices by a seasonality in the quality of information investors have.

There are reasons for higher risk stocks to be those seasonal traders would be most reluctant to trade. In deciding whether to try to exploit a seasonal, traders would be expected to consider the expected return-to-risk ratio. They would trade the riskier stocks only if expecting a higher return. In addition, the risk that relevant information is not known to the trader increases with systematic risk. Miller [40] hypothesizes that risk and divergence of opinion are correlated, and Swidler [63] confirms the hypothesis. If there is a relationship between beta and risk to the seasonal trader, the seasonal traders will be less effective in reducing seasonal fluctuations in high beta stocks, and the high beta stocks will have higher January returns.

Ritter and Chopra [50] show that high beta small capitalization stocks have appreciably higher returns than low beta small capitalization stocks even during the Januaries in which the overall market declines (contrary to the capital asset pricing model prediction that high beta stocks will underperform low beta stocks during declines). The high reward to holding high beta stocks in January is consistent with this theory (if beta is correlated to the obstacles to trading), but not with most alternative theories.[5]

## The Japanese Small Stock Seasonality

The Japanese evidence strongly supports the argument that the January size effect is due to something other than small stocks being sold preferentially for tax reasons. In the United States, a size effect could result from the greater variability of small stocks, making more of them candidates for year-end tax-loss selling. As noted earlier, there is no tax-related reason in Japan for heavy selling of stocks just before the turn of the year and no tax-related reason for preferentially selling small stocks then. Yet Kato and Schallheim [26, p. 258] show that the Japanese seasonal is strongest for small stocks. This would be consistent with seasonal traders requiring a larger spread for small stocks than for large ones before they would trade, an effect that should exist in Japan.

The Japanese data also show a June effect (clearly not due to taxes or Christmas). It could be due easily to investment of bonuses, usually paid in June and December. The June effect shows statistically significant positive returns for small firms (Kato and Schallheim [26, Table 7]). A small firm differential in returns when the cause is clearly not tax-related or Christmas-related is strong support for the theory that seasonal demand imbalances typically will have their strongest effects on the smallest firms.

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[5]Many philosophers of science believe that a theory is especially powerful when it predicts effects that were not known when it was developed. The first draft of this paper was written before the Ritter and Chopra results were known.

## Predictions of the Theory

This theory makes predictions extending beyond the year-end size effect.[6] Whenever there are seasonal shifts in the demand and supply for stocks as a whole, the observed return seasonalities will be greatest for the stocks for which the obstacles to arbitrage are unusually large. It is argued that a good surrogate for the obstacles to arbitrage is capitalization.

Another good surrogate for the obstacle to seasonal arbitrage is the absolute value of price. The spread is greatest in percentage terms for low priced stocks. Keim [28, Table A1] shows that the price-related turn-of-the-year return spread between high and low priced stocks exceeded the size-related turn-of-the-year spread for all 24 years of his data, supplementing Kross' [30] finding that the number of shares had no explanatory power after controlling for the absolute value of the stock price. Although one can imagine fundamental economic reasons (risk, information, or extent of institutional holdings) for the demand/supply balance for small firm stocks shifting around the turn of the year, the price of a stock is arbitrary, reflecting merely the number of shares by which the total value of the firm is divided. There are good institutional reasons (such as the quoting of prices in eights), however, for the obstacles to seasonal arbitrage to depend on the absolute value for the price. This provides indirect evidence that the price changes around the turn of the year may be influenced by the obstacles to seasonal arbitrage varying with firm price or size as well as by fundamental demand/supply shifts that occur around the turn of the year.

Lamoureaux and Sanger [34] show that for over-the-counter stocks the January return effect increases with the bid/ask spread within size deciles. In a multivariate regression, both market capitalization and spread are significant. Market maker theory shows that the spread reflects the risk and costs to trading against a seasonal regularity. The spread's correlation with the seasonal return provides strong support for the theory that the variation in excess January returns is determined by the size of the obstacles to trading profitably against the effect. Combined with the evidence from Keim's data showing a demand/supply shift around the turn of the year in the over-the-counter market, this provides powerful confirmation of the prediction of the theory that obstacles to arbitrage during a seasonal demand/supply shift will produce a return seasonal.

A testable implication of the theory is that other time-related effects will be greatest for low priced and neglected stocks. Rogalski [52], Harris [22], and

[6]This theory originally was developed to explain the small firm January effect. The success of the theory in explaining the results discussed here is encouraging, as they were not known when the theory originally was developed.

Keim and Stambaugh [29] all report that the day-of-the-week effect depends on firm size. Synn [64, p. 80] reports that the Friday effect is greatest for the smallest firms, with 73 percent of the total small firm effect occurring on Fridays.[7]

It is anticipated that other calendar-related rate of return anomalies will be found to exhibit a size (and/or a neglected stock or beta) effect. It recently has been reported (Market Logic [37]) that small stocks produce the best returns during the seasonably favorable turn-of-the-month and preholiday periods. Ariel [3] reports that there is a turn-of-the-month effect that is stronger with an equally weighted index than with a value-weighted index, suggesting it is stronger for small firms.

## Conclusions

There is a sharp demand/supply shift around the turn of the year. In the U.S. this shift is partially due to tax-loss selling. Tax loss selling cannot be the whole explanation, however, as similar effects are reported in countries with different fiscal year-ends and tax rules. A possible explanation is that investors under time pressure delay some investment decisions until after the busy holiday time period.

The price fluctuations caused by this demand/supply shift are moderated by the trading of market makers and seasonal arbitrageurs. The obstacles to such seasonal trading (including spreads, commissions, and asymmetric information) decrease with firm size, stock price, and the availability of information. The result is that the seasonal fluctuation is greatest for small stocks, low priced stocks, and stocks neglected by analysts.

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[7]Only after the theory was developed did the author become aware of this supporting evidence in the form of a size effect in daily stock returns. There appears to be an excess of buying relative to selling on Fridays and Thursdays and a surplus of selling on Mondays (see Miller [42] for a possible explanation). Whatever the reason for a day-of-the-week demand/supply imbalance, the argument given above suggest that arbitrage would reduce it much more for the large than for the small firms, causing the size effect to appear to be concentrated on certain days within the week.

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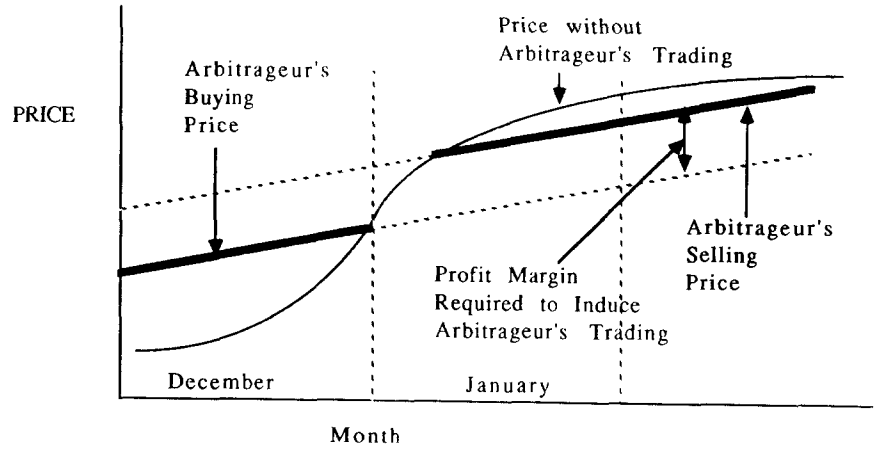
**Figure 1**
Arbitrageurs Effect on Year-End Price for Small Firms




Arbitrageurs Effect on Year-End Price for Large Companies