STOCK MARKET SEASONALITY: INTERNATIONAL EVIDENCE

By

Mustafa N. Gultekin*
and
N. Bulent Gultekin**

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THE WHARTON SCHOOL
University of Pennsylvania
Philadelphia, PA 19104

*New York University
**University of Pennsylvania

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Mustafa N. Gultekin
New York University

and

N. Bulent Gultekin
University of Pennsylvania

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ABSTRACT

This study examines empirically stock market seasonality in major industrialized countries. Evidence is provided that there are strong seasonalities in the stock market return distributions in most of the capital markets around the world. The seasonality, when it exists, appears to be caused by the disproportionately large January returns in most countries and April returns in the UK. With the exception of Australia, these months also coincide with the turn of the tax year.

Address proofs to: N. Bulent Gultekin
The Wharton School
University of Pennsylvania
Philadelphia, PA 19104

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1. Introduction

Properties of stock market returns in the U.S. and other countries have been a favorite subject of empirical research. Following Fama (1965, 1970), most of the previous research argued that common stock prices follow a multiplicative random walk and investigated the existence of seasonality as an indirect test of this hypothesis. Test methodology was usually based on the examination of the autocorrelation function of stock returns. A good summary of empirical work in this area can be found in Rozeff and Kinney (1976) for the U.S.; Kendall (1953) for the U.K.; Officer (1975) for Australia; and Richards (1979) for a number of European countries.

While the random walk model implies that stock market returns are time invariant, Rozeff and Kinney (1976) observe that in the U.S. stock returns for January are significantly larger than the returns for the remaining eleven months. Since then, Keim (1982) has discovered that this phenomenon is related to the abnormally high returns on small firm stocks observed by Banz (1981) and Reinganum (1981). He finds a significant portion of the small firms' higher risk-adjusted returns occurs in the first trading week of January.

Recently, Roll (1982) argues that this "January effect" is due to the tax-loss selling at the end of the tax-year. He also provides evidence that small firm stocks are affected more by the tax-loss selling than the large firm stocks are. Reinganum (1982) also reports similar findings.

Although recent empirical research suggests a close association between tax-loss selling and the January seasonality in the U.S., the anomaly is not yet fully understood. Brown, Keim, Kleidon and Marsh (1982), for example, find that while Australia has similar tax laws but a July-June tax year, Australian returns have December-January and July-August seasonals. It is, therefore, appropriate to investigate the existence and the pattern of the stock market seasonality in foreign securities markets in order to gain further understanding of this anomaly.

This paper empirically examines stock market seasonality in major industrialized countries. We find that the seasonal pattern observed in the U.S. is also present in value-weighted market indices of many other countries. With the exception of Australia, seasonalities, if they exist, are caused by the abnormally large mean returns at the turn of the tax year in most countries.

Our findings are organized in the following order. Stock market return data and their statistical properties are summarized in Section 2. Existence of stock market seasonality is investigated in Section 3. Abnormal month-to-month mean returns are analyzed in Section 4 and a brief summary is given in Section 5.

2. Data and their statistical properties

Stock market returns in this study are computed from the indices reported in Capital International Perspective (CIP).[1] CIP is published by Capital International S.A., an investment services firm based in Geneva, Switzerland, and it provides monthly stock market indices based on 1,100 share prices listed on the stock exchanges of 18 countries. These CIP indices represent approximately 60% of the total market value of all shares traded in these

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[1]We also used stock market indices reported in International Financial Statistics (IFS), published by the International Monetary Fund, since January 1947. Although IFS data are available for a longer time period and for a larger number of countries, these indices usually report daily or weekly average stock prices for a given month rather than the usual month-end prices. We repeated all the analyses in this study using the IFS data. The results are basically similar to those reported here. Further properties of the IFS data can be found in Gultekin (1983) and additional results in a longer version of this paper available from the authors.

countries. The fraction of the total share value represented by the index for each country ranges from 47% for Singapore to 80% for Norway.

CIP indices report month-end closing prices. They are value-weighted indices in local currencies. The monthly stock market returns are computed as percent changes in the monthly price indices without dividend yields.[2] *CIP* stock return series covers the period January 1959 - December 1979.

Table 1 shows estimates of the first twelve autocorrelations and the other descriptive measures of the stock market returns data. Most autocorrelations are not significantly different from zero. Only Austria, Denmark and Norway have serially correlated stock returns. The other descriptive measures include mean, standard deviation, skewness, kurtosis and studentized range. High positive skewness in several countries is primarily caused by extremely large outliers.[3] Also the studentized range shows that the stock market return of distributions deviates from a normal distribution in several countries. There is, however, no discernible pattern of the deviation.

3. Stock market seasonality

We first investigate the existence of seasonality in international capital markets. Seasonality, as in the other studies mentioned above,

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[2]We have dividend yields for the countries included in the *CIP* data for the period January 1969 - May 1978 from the same source. We did not find any seasonality in the dividend yields. Furthermore, addition of dividend yields does not change the rankings of stock returns for this period. Dividend yields thus does not account for the seasonality in stock returns we report in the next section.

[3]For example, the January 1975 return for the U.K. is 53.4, approximately 9 standard deviations away from the mean.

Table 1:

Summary statistics and autocorrelations of monthly

stock returns, 1/1959-12/1979; Capital International Perspective indices

Country	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5	ρ_6	ρ_7	ρ_8	ρ_9	ρ_{10}	ρ_{11}	ρ_{12}	Mean	σ	Skew-ness	Kurto-sis	S.R.
Australia	.039	.070	.040	-.098	-.112	.010	.037	.033	.182*	.001	.044	.046	.6667	5.563	.339	3.116	8.071†
Austria	.317*	.219	.036	-.006	-.006	.159*	.081	.089	.061	.066	.094	.148	.4629	3.188	2.323	12.005	10.033†
Belgium	.091	-.050	.145	-.058	-.108	.071	-.050	-.175*	.093	.037	-.050	.128	.1691	3.337	-.007	1.351	7.230†
Canada	.057	-.110	.131*	.024	.009	.043	-.105	-.131*	.030	-.020	.012	.088	.6131	4.229	-.1431	.958	6.580
Denmark	.285*	.180*	.137*	.141*	.116	.182*	.144*	.105	.047	-.116	-.044	.031	.2777	3.331	.737	4.295	8.913†
France	.026	-.014	.048	-.022	-.056	.063	-.076	-.075	.134*	.054	-.021	.039	.4264	5.611	.499	1.090	7.111†
Germany	.169*	.016	-.018	.046	.035	.095	.025	-.030	.056	.086	.060	.049	.4224	5.070	.597	1.328	6.740
Italy	.121	-.095	-.113	.017	.117	.095	.040	-.050	.074	.150*	.082	.018	.1809	6.308	.406	.659	6.532
Japan	.048	.059	-.036	.017	.010	-.018	.027	-.002	-.026	.061	.072	-.042	.9212	4.986	.055	.935	6.098
Netherland	.104	.003	.063	-.078	-.025	-.031	-.027	-.086	.122	.057	.080	.112	.2343	4.465	.199	1.738	7.431†
Norway	.176*	-.025	.208*	.007	.036	.242*	.030	-.052	.200*	.089	-.082	.075	.7123	5.760	.737	2.724	7.683†
Singapore	.205*	.064	-.102	.030	.031	-.132	-.062	.079	.123	.074	.028	.076	1.5056	10.169	1.273	5.002	6.851
Spain	.045	-.048	.104	.058	.056	.170*	.041	.013	.044	.136*	.081	.145*	.3184	4.209	-.050	.911	6.168
Sweden	.027	-.083	.112	.016	-.052	.091	.015	-.035	.004	.102	-.004	.031	.4377	4.175	-.077	-.077	4.948
Switzerland	.060	-.128*	.107	.032	.041	.013	.032	.031	.121	.087	-.061	.056	.5598	5.304	.347	1.220	7.219†
UK	.150*	-.069	.144*	.018	-.189*	-.026	.049	.000	.036	-.048	-.042	.081	.6962	6.54	2.162	17.117	11.170†
USA	.036	-.049	.069	.063	.037	-.129	-.105	-.017	.051	-.104	-.009	.106	.3184	4.016	.020	1.415	7.277†

[a]Data available for the period of 1/1970-12/1979. *Sample autocorrelation is at least two standard deviations to the left or to the right of its expected value under the hypothesis that the true autocorrelation is zero. σ is standard deviation; S.R. is studentized range. †Exceeds the .99 fractile of the distribution of the studentized range. Means and standard deviations are multiplied by 100.

implies that there are significant differences in the month-to-month mean returns. Identification of the month (or months) that has significantly larger means is discussed in the next section.

We have tested the existence of seasonality using both nonparametric and parametric methods. Since both methods yield materially similar results, we present only the results of nonparametric tests.[4] These results should also be directly comparable to the earlier U.S. results reported by Rozeff and Kinney [1976] using the same test procedures.

We used a nonparametric test developed by Kruskal and Wallis [henceforth K-W] (1952). Consider an arrangement of monthly stock market returns for a given country as a $T \times 12$ matrix, $R = [r_{tm}]$. Rows of R represent the years and each column represents the month of a year. Each element, r_{tm}, of the matrix R, then, is a return realized in month m of the year t. The K-W procedure is used to test the hypothesis that all 12 of the samples (i.e., columns of R) are drawn from the same population. Specifically, we test the hypothesis that the 12 months have identical means.

Our basic model of the returns for each country is

$$(1) \quad r_{tm} = \mu + \tau_m + e_{tm}, \qquad t = 1, 2, \ldots, T_m, \ m = 1, 2, \ldots, 12$$

where μ is the (unknown) overall mean, τ_m is the unknown month m effect and

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[4]Parametric methods involve testing the existence of seasonality and the differences in month-to-month mean returns using the following regression model:

$$\tilde{r}_t = a_1 + a_2 D_{2t} + a_3 D_{3t} + \cdots + a_{12} D_{12t} + \tilde{e}_t$$

where $\tilde{r}_t$ is the monthly stock return for the month t and D_{it} are the dummy variables indicating the month of the tax-year. a_1 measures the mean return of the first month of the tax-year, while a_2 through a_{12} measure the differences between the mean return for the first month of the tax-year and the returns for the remaining eleven months.

$\sum_{m=1}^{12} \tau_m = 0$. We assume that the error terms for each country, e_{tm}, are independent of the other error terms for that country. Moreover, all of the error terms for a country are drawn from the same continuous distribution. Note that these assumptions are consistent with the premise that the stock prices follow a multiplicative random walk.

For each country we test the null hypothesis that

$$H_0: \tau_1 = \tau_2 = \ldots = \tau_{12} = 0 \tag{2}$$

against the alternatives that all τ's are not equal.[5] Rejection of the null hypothesis implies that stock returns in a given country exhibit seasonality.

The K-W test first ranks the M observations ($M = \sum_{m=1}^{12} T_m$) jointly from least to greatest. Let x_{tm} denote the rank of r_{tm} in this joint ranking; the test statistic is

$$H = \frac{12}{M(M+1)} \sum_{m=1}^{12} T_m(\bar{X}_m - \bar{X}.)^2 \tag{3}$$

where $\bar{X}_m$ is the average rank received by the returns in the m^{th} month such that

$$\bar{X}_m = \frac{1}{T_m} \sum_{t=1}^{T_m} x_{tm} , \tag{4}$$

and $\bar{X}. = (M+1)/2$ which is the average rank of all M observations. When H_0 is

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[5]Note that the K-W test does not require that error terms, e, across the countries be uncorrelated. If e's are correlated, tests for individual countries are not independent of each other. We have also tested to see if there is a year effect using Friedman's (1937) two way layout test. In this case, model (1) becomes:

$$r_{tm} = \mu + \beta_t + \tau_m + \varepsilon_{tm} , \quad t = 1, 2, \ldots, T_m, \; m = 1, 2, \ldots, 12 ,$$

where β_t is a possible year effect. The null hypothesis to be tested is the same as in (2). The results are the same as those using the K-W method.

true, the statistic H has an asymptotic chi-square distribution with 11 degrees of freedom. The appropriate α-level test is

$$\text{reject } H_0 \text{ if } H \geqslant \chi^2(11, \alpha)$$

where $\chi^2(11,\alpha)$ is the upper α percentile point of a χ^2 distribution with 11 degrees of freedom.

Since this procedure uses the rankings of the observations, it is not sensitive to outliers. Furthermore, the K-W test requires no distributional assumptions about the stock returns. Therefore it is less restrictive than parametric tests.[6]

Table 2 presents month-to-month mean returns on the CIP indices. A visual inspection of this table reveals substantial variation in the monthly returns. Formal tests of the equality of month-to-month mean returns are shown in the last two columns of Table 2. These two columns present the K-W test statistics and the significance levels at which the null hypothesis in (2) can be rejected. The test statistics show that seasonality exists in most of the foreign securities markets. The null hypothesis that stock returns are time invariant is rejected for 12 countries from a total of 17 at the 10% significance level.[7]

The U.S. stock market returns using the CIP data do not exhibit seasonality, a result different from those reported by Rozeff and Kinney and others. This stems from the differences in the stock market indices used in

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[6]See Hollander and Wolfe (1973) pp. 114-120 for further details.

[7]Kruskal and Wallis (1952) found that for small significance levels (10% or less), the true level of significance is smaller than the stated level of significance associated with the chi-square distribution. This indicates that the chi-square approximation furnishes a conservative test in many if not most situations. The 10% significance level, therefore, is consistent with this feature of the tests.

Table 2

Month-to-month mean stock market returns and the tests of equality of mean returns
January 1959 - December 1979; Capital International Perspective indices

Country	Month-to-Month Mean Returns[a]												Kruskal-Wallis Tests[b]	
	January	February	March	April	May	June	July	August	September	October	November	December	Statistic	Probability
Australia	2.649	-.581	.506	.841	.973	.428	.662	-.365	-2.387	2.130	-.848	3.993	20.18*	.0430
Austria	.743	.890	.239	-.414	.067	.213	1.237	.899	.021	-.224	.651	1.233	12.95	.2965
Belgium	3.215	1.085	.395	1.482	-1.355	-.840	1.441	-1.166	-1.866	-.688	.415	-.089	39.40*	.0001
Canada	2.900	.068	.789	.408	-.963	-.300	.689	.600	-.061	-.820	1.435	2.611	18.59*	.0689
Denmark	3.041	-.407	-1.191	.584	.448	.383	.506	-.138	-1.297	.264	-.900	2.037	35.53*	.0002
France	3.722	-.176	1.983	.936	-.656	-1.902	1.529	1.028	-1.214	-.719	.433	.152	15.10	.1779
Germany	3.099	-.142	1.048	-.605	-.016	-.948	1.559	2.243	-1.681	-.936	1.356	.092	24.27*	.0116
Italy	2.229	.865	.737	.723	-1.303	-.411	-.573	2.346	-.724	-1.292	-.255	-.171	9.90	.5398
Japan	3.529	1.128	1.877	.301	.975	2.059	-.321	-.829	-.133	-.976	1.646	1.798	20.30*	.0414
Netherlands	3.762	-.474	1.298	1.387	-.982	-1.436	.492	-.283	-1.911	-.246	-.102	1.308	27.50*	.0039
Norway	4.336	-1.176	-.627	2.363	.291	1.953	3.010	.366	-1.559	-.508	.419	-.320	29.51*	.0019
Singapore[c]	10.591	-.418	2.093	-2.315	4.015	.307	-.487	-.375	-.954	2.350	-1.966	5.227	11.51	.4018
Spain	2.241	1.294	.321	1.588	-1.873	.062	.794	1.290	-1.641	.189	-.436	-.009	26.62*	.0052
Sweden	3.996	.383	1.006	.879	-.795	-.246	2.409	-1.098	-1.335	-.673	-.179	.823	31.46*	.0009
Switzerland	4.585	-.747	.395	.858	-1.267	-.020	.647	1.746	-1.536	-.194	.985	1.266	17.60*	.0914
UK	3.406	.687	1.248	3.129	-1.212	-1.689	-1.112	1.883	-.239	.798	-.608	2.063	17.57*	.0920
US	1.041	-.410	1.266	.959	-1.384	-.560	.139	.338	-.795	.780	1.027	1.419	12.99	.2941
US, EW[d]	5.080	.545	1.545	.443	-1.418	-1.003	.734	.717	-.416	-.786	1.792	1.367	17.26	.1005
US, EW:47-79[e]	4.449	.476	1.922	.523	-.297	-.421	1.766	.759	.083	-.156	2.065	2.075	22.52*	.0207

[a]Means are multiplied by 100. Number of observations is 21 for each month. [b]The Kruskal-Wallis test statistic is approximately distributed as chi-square with 11 degrees of freedom. It tests the null hypothesis that month-to-month mean returns are equal against the alternative that they are not. Critical value for the chi-square distribution with 11 degrees of freedom at 10% significance level is 17.27. [c]Data are available for the period 1/1970-12/1979. [d]Mean returns on the equally weighted (EW) NYSE index for the period 1/1959-12/1979. [e]For the period 1/1947-12/1979. *Indicates the rejection of the null hypothesis that mean returns are equal at 10% significance level or less. Probability value is the probability that a chi-square statistic is at least as large as the one reported would be realized if the null hypothesis is true, i.e., mean returns are equal.

our study and others. CIP indices are value-weighted portfolios. Rozeff and Kinney used the equally weighted NYSE price index which gives more weight to the small firms.

The last two lines in Table 2 show the month-to-month mean returns and the K-W test statistics for the equally-weighted NYSE index for the periods 1959-79 and 1947-79. The null hypothesis can be rejected at the margin for the 1959-79, but any conventional significance level for the 1947-79 period.[8] This is a confirmation of a result reported by Roseff and Kinney. It is also consistent with Keim's (1982) finding that seasonality is primarily caused by extremely large returns on small firm stocks in January.

When the result using the equally-weighted NYSE index from the U.S. is included, there appears to be a widespread seasonality in most securities markets. In a group of 17 capital markets around the world, 13 of them have seasonality in stock return distributions.[9]

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[8]Interestingly, seasonality can still be detected for the value-weighted NYSE index at the 10% significance level for the period January 1947-December 1979. The test statistic is 17.83, the critical value for the chi-square test is 17.27 at the 10% level of significance and 19.7 at the 5% level. Seasonality is usually found to exist for the equally-weighted NYSE index even when the sample period is broken down to smaller subperiods. This is not the case for the mean returns on the value-weighted NYSE index. For example, for the 1/1926-12/1979 period, the test statistics are 27.45 and 14.56 for the equally- and value-weighted indices respectively. The same test statistics are 18.04 and 13.01 for 1/1941-12/1974, a period also investigated by Rozeff and Kinney.

[9]Recall that (see footnote 2) IFS data cover a longer period from 1/1947 to 12/1979. During this time period, stock returns in Austria, France and Italy also exhibit seasonality. Additional stock returns data are available for Israel, New Zealand and South Africa in IFS. Seasonality is observed for the South African stock returns but not for Israel and New Zealand. When results from IFS data are included, seasonality is observed in 18 out of 20 capital markets for the 1947-79 period.

4. Months responsible for seasonalities in capital markets

Our results so far establish the existence of a strong seasonality in many foreign securities markets. In this section, we investigate the pattern of the seasonality.

Recent research has attributed the seasonality in the U.S. stock returns in large part to tax-loss selling which predicts that returns will be higher in the first month of the tax-year.[10] (See, for example, Roll (1982) and Reinganum (1982).) Brown, Keim, Kleidon and Marsh (1982), on the other hand, argue that the tax-loss selling hypothesis does not unambiguously predict such an effect. They indicate that while Australia has similar tax laws but a July-June tax-year, Autralian returns show December-January and July-August seasonals.

It is possible to provide an indirect test of the tax loss selling hypothesis using our data by comparing the mean returns at the turn of the

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[10]The tax-loss selling hypothesis argues that there is a downward pressure on the prices of those stocks which have declined during the year as investors attempt to realize their losses against their taxable income. After the end of the tax-year, price pressure disappears and the prices reach equilibrium level. Thus we observe abnormally large returns at the turn of the tax-year. While a tax induced seasonality was suggested earlier by Wachtel (1947) and more recently by Branch (1977) and Dyl (1977), there is a theoretical void surrounding the January effect in the U.S. To our knowledge the only theoretical work in this area is provided by Constantinides (1982). He argues that with transactions costs, it is optimal for the U.S. shareholders to realize tax-losses at the end of the tax-year.

Others have suggested that the anomalous January mean return in the U.S. is partly due to the new information provided by the firms at the end of the fiscal year. Keim, for example, suggests that "[t]he month of January marks a period of increased uncertainty and anticipation due to the impending release of important information. In addition, the gradual dissemination of this information during January may have a greater impact on the prices of small firms relative to large firms for which the gathering and processing of information by investors is a less costly process." Our findings, however, do not provide any support for this "information hypothesis" for two reasons. First, our sample primarily consists of large firms. Second, corporations in almost all countries in our data can choose accounting periods different from the tax-year. For example, Japanese firms have two six-month accounting periods ending in March and September.

tax-year with the mean returns of the remaining eleven months for those countries with a significant K-W test statistic.

Summary information on tax years and rules for resident shareholders in the countries covered in this study are shown on Panels A and B of Table 3.[11] A visual inspection of Table 2 and Panel B of Table 3 reveals a close association between the tax year and the large mean returns. We will, however, show formally whether these returns are also statistically greater than other months using a nonparametric "control versus treatment" procedure.[12] In this test, the researcher can formally compare a priori

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[11]The tax information is collected from Price Waterhouse Information Guides or from interviews with the Price Waterhouse officials. A more detailed summary is available from the authors. We should point out that in almost all countries, speculators, and frequent traders and institutions and brokerage houses should treat their gains or losses from trading of common stocks as ordinary income or loss. This means that there is a substantial group of investors who can take advantage of tax-loss selling even in the absence of a capital gain tax. See Brown, Keim, Kleidon and Marsh (1982) for a detailed explanation of a similar case for Australia.

In the U.K., for example, capital gains tax has been instituted for individual shareholders since April 6, 1965 and for corporate shareholders since April 6, 1975. We repeated seasonality tests for the U.K. in order to see the impact of the tax law changes by dividing the sample into two subperiods around April, 1965. Seasonality exists in both subperiods. The Kruskal-Wallis test statistic is 23.04 for the first subperiod 1/1947-3/1965 and 18.90 for the second subperiod 4/1965-12/1979 using the IFS data. The mean return for April is significantly larger than all the remaining months in the first subperiod. April also has a larger mean return in the second subperiod than all months except May, January, September and December.

A similar situation also exists for Canada. Capital gains tax for individuals and corporations has been instituted since January 1, 1972. Like the U.K., we found that seasonality exists before the tax laws change. Using the IFS data, the Kruskal-Wallis test statistic is 22.80 for the period 1/1947-12/1971. January also has a larger mean return than the remaining months except April, May, November and December at the 10% level. Seasonality is not detected for the 1/1972-12/1979 period.

[12]There is no a priori reason, unless formally tested, to believe that the largest mean return is systematically related to the tax loss selling hypothesis. For example, it is possible that the K-W test rejects the equivalence of the month-to-month returns because the large return at the turn of the tax year is significantly larger than the month with the smallest mean return while it is not statistically different than any other month.

identifiable "control" month to eleven other "treatment" months.

The test procedure is in many ways similar to the K-W test. It assumes the same model of returns as shown in equation (1) and the same properties about the error term for each country. Furthermore, the null hypothesis of the "control versus treatment" test is also the same as in the K-W test given in (2) that there is no treatment effect ($\tau_1 = \tau_2 = \dots = \tau_{12}$). The alternative hypothesis, however, is different and states that $\tau_1 \geqslant \tau_m$ for all $m \geqslant 2$ and $\tau_1 > \tau_m$ for at least one month $m \geqslant 2$.

Formally, using the basic model of returns in equation (1), the one-sided test procedure, at an experimentwise (overall) significance level of α, is:

(5) decide $\tau_1 > \tau_m$

if

(6) $$\bar{X}_1 - \bar{X}_m \geqslant z_{(\alpha/(k-1))}\left[\frac{M(M+1)}{12}\right]\left(\frac{1}{T_1} + \frac{1}{T_m}\right), \qquad m = 2, 3, \dots, k; \ (k=12)$$

where $z_{(\alpha/(k-1))}$ is the upper $100(\alpha/(k-1))$ percentage point of the unit normal distribution. T_1 and T_m are the number of observations in the "control" and the m^{th} treatment month, M is the total number of observations ($M = \sum_{m=1}^{12} T_m$). $\bar{X}_m$ is the mean of the rank of returns for the m^{th} month defined as in equation (4) in which the rank of a return is determined within the entire M observations.

The control versus treatment procedure thus compares the mean rank of returns of the "control" month to the ranks of return of the remaining eleven months, while the K-W test compares the mean rank of returns of each month with the overall mean rank of all M observations. Since the research (alternative) hypothesis states that the first month of the tax year has larger mean returns, there is no need to compare all pairs of treatments, but only each treatment month with the control month (beginning of the tax year) for each country. Consequently, the decision rule in equation (5) is simply a restatement of the rejection of the null hypothesis in (1) against the alternative that $\tau_1 > \tau_m$. Also note that the size of the test, α, is the probability under the null hypothesis that inequality (6) will be satisfied for at least one month $m \geq 2$. (For any given month, m, the probability that inequality (6) will be satisfied is much less than α.)[13]

Panel C of Table 3 shows the results of the comparisons, i.e., whether the mean rank of returns in the first month of the tax year is statistically greater than those in the remaining months at the 10 percent significance level for each country.

There is a striking pattern of seasonality in Table 3 using both CIP data and the equally weighted NYSE index for the US. For all countries with a significant K-W test statistic and a January-December tax year, the mean rank of January returns appears to be significantly larger than most other months. The UK and Australia are the two countries in our data with a significant K-W test statistic and a non-January-December tax year. In the UK, April is the beginning of the tax year and the mean rank of April returns for the UK is larger than most other months'. For Australia, however, we reject the research hypothesis which predicts higher July returns. December returns have a higher mean rank than most other months in Australia. Also note that those months with the largest mean rank of returns in Table 3 also

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[13]The control versus treatment procedure is fully explained in Hollander and Wolfe (1973) pp. 129-132. Various versions of the procedure are developed by Miller (1966). The approximation in (6) is provided by Dunn (1964).

Table 3
Test of the research hypothesis[a] that mean returns are larger at the beginning of the tax year
1/1959-12/1979

Country	Panel A: capital gains tax[b]	Panel B: Beginning of tax year (control month)	Panel C: Is the mean rank of returns at the beginning of the tax year significantly greater than the mean rank in any other month?[c]
Australia	No	July 1	No
Belgium	Yes	January 1	Yes, all other months
Canada	Yes[d]	January 1	Yes, all except November and December
Denmark	Yes	January 1	Yes, all except December
Germany	Yes	January 1	Yes, all except August, July, March and November
Japan	Yes[e]	January 1	Yes, all other months
Netherlands	Yes[e]	January 1	Yes, all except April, March and December
Norway	Yes	January 1	Yes, all except July
Spain	Yes	January 1	Yes, all except August, April, February and July
Sweden	Yes	January 1	Yes, all except July
Switzerland	Yes[e]	January 1	Yes, all except August
UK	Yes[f]	April 1 and 6[g]	Yes, all except August, March and January
U.S.A.	Yes[h]	January 1	Yes, all except March, July, November and December

[a]The research hypothesis is the tax loss selling hypothesis which predicts larger mean returns at the turn of the tax year. [b]This information is gathered from Price Waterhouse Information Guides. [c]The beginning-of-year return is said to be larger than the return for month m if and only if equation (6) is satisfied for month m. [d]Taxable since 1/1/1972. [e]Not taxable for individual shareholders.
[f]Taxable since 6/3/1965 for individual shareholders and since April 6, 1975 for corporate shareholders. [g]April 1 is for corporations and April 6 is for individuals.
[h]Using equally weighted NYSE index for the 1/1947-12/1979 period.

correspond to the months with the largest mean returns in Table 2.[14]

In summary, results in Table 3 indicate a prevalent association between the large mean returns and the turn of the tax-year as predicted by the tax-loss selling hypothesis. These findings, like those in the U.S., do not rule out a tax induced "January effect" in most countries except Australia and also a tax induced "April effect" in the U.K.[15] This empirical regularity, on the other hand, should not be used to infer a cause and effect relationship between the turn of the tax-year and the observed seasonalities. Our data

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[14]With the exception of Australia, mean rank of returns at the turn of the tax year is unambiguously the largest for each country shown in Table 2. For Australia, July has the sixth largest mean rank of returns. Also with the exception of the U.K., the largest mean rank of returns always corresponds to the largest mean return shown in Table 2 for each country. The January 1975 return in the U.K. is an outlier. Its value is 53.4 and it is the largest monthly return in the entire data set. This is why the mean of the January return is slightly larger than the April mean return in Table 2 while the mean rank of April returns is the largest in Table 3. We crosschecked our results using the IFS data for the U.K. for the period 1947-79. April mean return is 3.115 while January mean return is 1.377 in the IFS data. Moreover, the mean rank of the April return is larger than all other months at the 10% significance level, indicating an unambiguous April seasonal in the U.K. for the period 1947-79.

[15]Particularly, one could make a good case for a tax induced seasonality in the U.K. Since returns are not independent across countries, the high April mean return in the U.K. cannot be attributed to a January effect observed in other countries even if the prevalent January seasonal in other countries is not a tax related phenomenon. Furthermore, in the U.K., investors are allowed to realize tax losses by selling a security at the end of the tax year and buying the same security on the following morning. The 30-day wash sale rule as in the U.S. does not exist in the U.K. Investors, however, should have held the security at least for 30 days before the sale in order to qualify for tax-loss. Interestingly, British investors engage in this tax-loss selling realizing activity at the end of the tax-year frequently and call it "bed and breakfasting." Not only does this realize a tax loss for the year but because the transaction is closed within the two week account period, brokerage commission is only paid on one side of the transaction and no stamp duty is payable to the government.

We should note that South Africa in the IFS data has a March-February tax year, but the January returns are larger than all months except August, February, April and July. Also, corporations in Canada, Japan, Spain and to a certain extent, in Sweden can choose a tax year corresponding to their own accounting fiscal period.

consist of aggregate indices, and such data do not permit an analysis similar to that by Roll (1982) and Reinganum (1982) linking the "January effect" to tax-loss selling in the U.S. Given the unusual pattern, however, the ritual call for further research in this direction seems to be appropriate.

Another implication of our results is related to the "size effect" in the U.S. Roll most recently provides an explanation for the disproportionate effect of tax-loss pressure on small firms. He argues that returns on small firm stocks have higher volatilities and, thus, they are more likely candidates for tax-loss selling in any given year. He also shows that the tax-loss selling phenomenon is present with large firms, but in large firms it is more likely to be arbitraged away because transactions costs are lower and the volume of trading is higher. The CIP indices, on the other hand, are value-weighted indices and, thus, small firms are not given disproportionate weight. Furthermore, these indices contain the stock prices of the largest corporations not only in each country, but also in the world. Our findings, therefore, cannot be attributed to a size related anomaly.[16]

5. Conclusions

We find evidence of a seasonal pattern in the stock returns in most of the major industrial countries. The seasonality is usually manifested in a significantly large mean return at the turn of the tax-year. For most countries this large return occurs in January. Furthermore, seasonality in these countries is not a size related anomaly.

While our findings indicate a close association between the observed seasonality and the turn of the tax-year, the aggregate nature of our data

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[16]Our findings, on the other hand, do not rule out size related anomalies. Since CIP indices consist of primarily large firms, it is not possible to examine size related anomalies using our data.

does not allow us to make definitive statements about the causality of this association. The unusual pattern of the seasonality around the tax-year seems, however, to warrant further country-by-country analysis using disaggregate individual stock return data.

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