Day of the Week Effects: Recent Evidence from Nineteen Stock Markets

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Abstract

This paper provides international evidence for the presence of the day of the week effects in stock market returns denominated in both local currencies and the US dollars in most of the nineteen countries in the sample for the period July 1993 to July 1998. The observed daily patterns differ for local and dollar returns, the latter being exhibiting lower daily means and higher standard deviations. In local currency terms, a pattern of higher returns around the middle of the week, Tuesday and then Wednesday; and a lower pattern towards the end of the week, Thursday and then Friday, are observed. In dollar terms, a higher pattern occurs around the middle of the week, Wednesday and then Tuesday; and a lower one is observed towards the end of the week, Thursday and then Friday. The lower patterns are more apparent in both cases. Volatility is the highest on Mondays in both local and dollar returns. Local returns have the lowest volatility towards the end of the week, Thursday and Friday, whereas the lowest volatility of dollar returns are observed on Tuesdays. The results have useful implications for international portfolio diversification.

Keywords: day of the week effects, volatility, international stock markets
JEL: G12, G14

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1. Introduction

The existence of predictable seasonal behavior in stock returns may lead to profitable trading strategies, and in turn, abnormal returns. Seasonality is an important factor of predictable behaviors in stock returns. The variability of stock returns according to the day of the week is one of the most often analyzed seasonalities in the finance literature.

Vast number of studies provide evidence for daily seasonalities in international stock markets. Jaffe and Westerfield (1985a,b) test for the weekend effect and find out significant negative mean returns on Mondays in the US, Canada and the UK stock markets and significant negative Tuesday returns in the Japanese and Australian stock markets. Aggarwal and Rivoli (1989) observe lower mean returns on Mondays and Tuesdays in stock returns of Hong Kong, Singapore, Malaysia and the Philippines from September 1976 to June 1988. Both in Jaffe and Westerfield (1985a, b), and Aggarwal and Rivoli (1989), the strong Tuesday effect is attributable to the +13 hour time difference between New York and these four markets.

Agrawal and Tandon (1994) provide international evidence for several seasonalities in stock markets of eighteen countries (Australia, Belgium, Brazil, Canada, Denmark, France, Germany, Hong Kong, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Singapore, Sweden, Switzerland, and the UK) other than the USA. They find large, positive mean returns on Fridays and Wednesdays in most of the countries. They observe lower or negative mean returns on Mondays and Tuesdays, and higher and positive returns from Wednesday to Friday in almost all the countries.

Balaban (1995, 1996) reports that in the Turkish stock market for the period January 1988 to August 1994 the highest returns and the lowest standard deviations on Fridays followed by Wednesdays. He observes the lowest and negative mean returns on Tuesdays, and the highest standard deviations on Mondays. In addition, he notes that the day of the week effects *change* in *direction* and *magnitude* across years. Balaban (1999) claims that observed anomalies can be partly attributed to the settlements rules in the Turkish stock market. Dubois and Louvet (1996), find negative returns on Mondays and Tuesdays and positive returns on Wednesdays for eleven indices in nine countries from 1969 to 1992.

This study first provides further international evidence for the presence of the day

of the week effects in local currency terms from a majority of stock markets in nineteen countries. In this respect, it extends the analysis of most of the countries examined in Agrawal and Tandon (1994) and covers some others for a more recent time period. Second, the current work provides evidence for the presence of the day of the week effects in the mean returns denominated in dollars from most of stock markets of eighteen countries, excluding the USA. This may be of particular interest for the global investor.

2. Data And Research Design

Daily observations of stock market indices from nineteen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong-Kong, Italy, Japan, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the UK, and the USA) are used to examine the daily patterns. Daily stock market indices, both in the local currency and the US dollars, are obtained from *DataStream* which provides adjusted market value weighted composite indices using daily closing prices. The sample period ranges between July 20, 1993 and July 1, 1998. Daily returns that amount to 1290 observations for each country are calculated as follows:

$$ {}_cR_t = 1000\,[({}_cI_t - {}_cI_{t-1})/\,{}_cI_{t-1}] \qquad (1) $$

where ${}_cI_t$ and ${}_cR_t$ are, respectively, the closing value of stock market index and return multiplied by thousand on day t in terms of currency c; i.e. local currency or the US dollar.

We run the following regression with binary dummy variables for each country to test whether there is any statistically significant difference among stock market returns, both in local currency and the US dollar terms, on different days of the week:

$$ {}_cR_t = \sum_{i=1}^{5} B_i D_{it} + u_t \qquad (2) $$

where $D_{1t} = 1$ if day t is a Monday and 0 otherwise; $D_{2t} = 1$ if day t is a Tuesday and 0 otherwise; and so on. The coefficients B_1 to B_5 are the mean returns for Monday through Friday, respectively. The stochastic error term is given by u_t.

We test the following null hypothesis of equal mean returns across days of the week:

$$B_1 = B_2 = B_3 = B_4 = B_5 \quad (3)$$

If the daily returns are drawn from an identical distribution, they will be expected to be equal. However, the rejection of the null hypothesis would indicate a specific observable pattern in the stock market returns, thus violation of weak-form market efficiency.

3. Empirical Results

The results for the test of equality of mean returns denominated in local currency and dollars across the days of the week for each country are provided in Table 1 and Table 2 respectively. The *F*-test results indicate that for returns denominated in local currencies, the null hypothesis of equality of mean returns across the days of the week can be rejected at the 1% significance level in nine stock markets, at the 5% level in eleven markets, and at the 10% level in *fourteen* markets, *excluding* those in Australia, Austria, Hong Kong, Japan, and Norway.

Table 1
Regression Results for Local Currency Returns

Countries	B_1	B_2	B_3	B_4	B_5	R^2-Adj	F-value	P-value	DW
Australia	0.43	-0.36	1.22	0.30	0.08	0.11	1.288	0.2666	2.093
	(0.79)	(-0.66)	(2.25)**	(0.55)	(0.15)				
Austria	0.70	0.40	1.05	-0.25	-0.39	0.15	1.384	0.2274	2.013
	(1.32)	(0.76)	(1.97)**	(-0.48)	(-0.72)				
Belgium	0.85	1.01	0.92	0.36	0.61	0.82	3.131	0.0082	2.240
	(1.92)*	(2.26)**	(2.08)**	(0.81)	(1.37)				
Canada	0.79	1.50	0.52	-0.23	0.41	0.93	3.433	0.0044	2.099
	(1.78)*	(3.39)***	(1.18)	(-0.52)	(0.93)				
Denmark	1.25	1.22	1.05	0.35	-0.10	0.70	2.820	0.0154	2.000
	(2.27)**	(2.22)**	(1.89)*	(0.64)	(-0.18)				
Finland	0.78	1.57	2.12	0.94	1.22	0.46	2.200	0.0521	2.102
	(0.82)	(1.66)*	(2.23)**	(0.99)	(1.28)				
France	0.41	1.68	1.58	-0.29	0.23	0.70	2.819	0.0154	2.098
	(0.65)	(2.66)***	(2.50)**	(-0.46)	(0.36)				
Germany	1.89	1.09	2.34	-0.29	-0.76	1.78	5.685	0.0000	2.083
	(3.05)***	(1.77)*	(3.79)***	(-0.46)	(-1.22)				
Hong Kong	0.30	0.32	1.47	-2.37	0.99	0.13	1.327	0.2500	2.034
	(0.26)	(0.28)	(1.27)	(-2.04)**	(0.85)				
Italy	-0.25	2.21	0.05	0.86	1.26	0.40	2.040	0.0705	2.089
	(-0.30)	(2.62)***	(0.05)	(1.01)	(1.49)				
Japan	-1.61	1.17	0.49	0.00	-0.30	0.28	1.734	0.1238	2.115
	(-2.29)**	(1.66)*	(0.70)	(0.00)	(-0.43)				
Netherlands	2.51	0.91	1.44	-0.57	0.52	1.66	5.357	0.0001	2.047
	(4.15)***	(1.50)	(2.38)**	(-0.95)	(0.86)				
New Zealand	-1.25	-0.90	3.09	0.79	-0.40	1.43	4.750	0.0003	2.121
	(-1.71)*	(-1.23)	(4.22)***	(1.09)	(-0.55)				
Norway	0.40	1.11	0.69	0.10	0.72	0.09	1.235	0.2905	2.034
	(0.63)	(1.78)*	(1.11)	(0.17)	(1.16)				
Spain	0.62	1.73	0.81	0.81	1.59	0.80	3.085	0.0090	2.144
	(0.91)	(2.53)**	(1.19)	(1.19)	(2.32)**				
Swenden	2.22	0.78	0.93	0.68	0.71	0.79	3.042	0.0098	2.108
	(3.19)***	(1.13)	(1.33)	(0.97)	(1.03)				
Switzerland	1.07	1.36	1.58	0.13	0.79	1.12	3.910	0.0016	2.152
	(1.91)*	(2.42)**	(2.83)***	(0.23)	(1.41)				
UK	0.28	0.85	1.09	0.35	0.35	0.44	2.134	0.0590	2.151
	(0.62)	(1.86)*	(2.38)**	(0.77)	(0.76)				
USA	0.93	1.83	0.56	-0.25	0.82	1.45	4.801	0.0002	2.175
	(2.00)**	(3.90)***	(1.19)	(-0.53)	(1.76)*				

The values in parantheses denote the t-value of the coefficients. *, **, and *** denote statistical significance of given coefficients at 10%, 5% and 1% respectively.

Table 2.
Regression Results for Dollar Returns

Countries	B_1	B_2	B_3	B_4	B_5	R^2-Adj	F-value	P-value	DW
Australia	-0.33	-0.32	1.11	0.44	0.50	-0.05	0.867	0.5028	2.107
	(-0.51)	(-0.48)	(1.68)*	(0.66)	(0.76)				
Austria	0.77	-0.05	0.91	-0.16	-0.19	-0.06	0.845	0.5180	2.069
	(1.29)	(-0.08)	(1.54)	(-0.26)	(-0.32)				
Belgium	0.81	0.65	0.94	0.15	0.98	0.47	2.219	0.0502	2.244
	(1.57)	(1.27)	(1.83)*	(0.29)	(1.90)*				
Canada	0.50	1.38	0.80	-0.53	0.33	0.63	2.633	0.0223	2.126
	(1.03)	(2.80)***	(1.63)*	(-1.08)	(0.68)				
Denmark	1.13	0.86	0.99	0.46	0.16	0.34	1.876	0.0956	2.128
	(1.93)*	(1.47)	(1.68)*	(0.78)	(0.27)				
Finland	1.02	1.17	2.26	0.84	1.54	0.47	2.219	0.0502	2.019
	(1.05)	(1.20)	(2.31)**	(0.86)	(1.57)				
France	0.30	1.30	1.59	-0.27	0.48	0.56	2.445	0.0324	2.079
	(0.49)	(2.12)**	(2.59)***	(-0.44)	(0.78)				
Germany	1.91	0.63	2.24	-0.27	-0.48	1.39	4.630	0.0003	2.096
	(3.00)***	(1.00)	(3.52)***	(-0.43)	(-0.75)				
Hong Kong	0.34	0.32	1.48	-2.38	0.96	0.13	1.330	0.2487	2.034
	(0.29)	(0.27)	(1.27)	(-2.05)**	(0.83)				
Italy	-0.35	2.04	-0.04	1.02	1.09	0.22	1.577	0.1634	2.125
	(-0.39)	(2.24)**	(-0.05)	(1.12)	(1.20)				
Japan	-1.57	0.86	0.53	-0.32	-0.57	0.05	1.137	0.3388	2.102
	(-1.89)*	(1.04)	(0.64)	(-0.39)	(-0.69)				
Netherlands	2.51	0.40	1.35	-0.58	0.82	1.76	5.609	0.0000	2.085
	(4.36)***	(0.70)	(2.34)**	(-1.01)	(1.42)				
New Zealand	-1.55	-0.79	2.88	0.68	-0.07	1.03	3.694	0.0025	2.062
	(-1.94)*	(-0.99)	(3.61)***	(0.85)	(-0.09)				
Norway	0.21	0.36	0.85	0.09	1.30	0.09	1.228	0.2937	2.042
	(0.33)	(0.56)	(1.31)	(0.14)	(2.00)**				
Spain	0.65	1.49	0.59	0.70	1.57	0.57	2.465	0.0311	2.159
	(0.94)	(2.14)**	(0.85)	(1.01)	(2.26)**				
Sweden	1.96	0.33	1.17	0.73	1.14	0.59	2.537	0.0270	2.151
	(2.61)***	(0.43)	(1.56)	(0.97)	(1.52)				
Switzerland	1.17	0.98	1.54	-0.01	1.19	1.04	3.704	0.0025	2.146
	(2.04)**	(1.71)*	(2.68)***	(-0.02)	(2.07)**				
UK	0.44	0.92	0.96	0.50	0.48	0.42	2.080	0.0654	2.174
	(0.90)	(1.90)*	(1.99)**	(1.03)	(0.99)				
USA	0.93	1.83	0.56	-0.25	0.82	1.45	4.801	0.0002	2.175
	(2.00)**	(3.90)***	(1.19)	(-0.53)	(1.76)*				

The values in parantheses denote the t-value of the coefficients. *, **, and *** denote statistical significance of given coefficients at 10%, 5% and 1% respectively.

Similarly, the same null hypothesis for mean returns in dollars can be rejected in stock markets of four countries (significant at 1%), in eight countries (significant at 5%), in *twelve* countries (significant at 10%), *excluding* Italy and the USA *in addition to* the five countries above. Therefore, we *hereafter* focus on *only* the markets with daily patterns significant at least at the 10% level.

Table 3 and Table 4 are for daily descriptive data regarding the stock market returns in local currency and dollars respectively. In terms of local currency, on Tuesdays eleven of the *fourteen* countries exhibit *significantly positive* mean returns, excluding the Netherlands, New Zealand and Sweden. Wednesday returns are *large* and *significantly positive* in nine countries, excluding Canada, Italy, Spain,

Sweden and the USA. Note that *no* negative mean returns are observed on Wednesdays. On Mondays, eight countries, excluding Finland, France, Italy, Spain and the UK, exhibit *significantly positive* mean returns, and *only* in one country, New Zealand, a *significantly negative* mean return is observed. The mean returns on Fridays are lower or negative but not significant in all countries except Spain and the USA, having significant positive mean returns. Mean returns on Thursdays are generally lower or negative but not at a significant level. There is a general pattern of higher returns around the middle of the week (Tuesday and then Wednesday) in seven countries and a pattern of lower returns towards the end of the week (Thursday and then Friday) in all countries except Spain and the USA. Note that the lower pattern is more apparent compared to the higher one.

Table 3
Daily Summary Statistics for Local Currency Returns

Countries		Monday	Tuesday	Wednesday	Thursday	Friday
Australia	**Mean**	0.43	-0.36	1.22	0.30	0.08
	SD	9.33	9.03	8.85	7.72	8.77
	CV	21.67	-25.05	7.22	25.61	106.79
Austria	**Mean**	0.70	0.40	1.05	-0.25	-0.39
	SD	9.34	9.59	8.27	7.39	8.08
	CV	13.27	23.78	7.88	-29.15	-20.99
Belgium	**Mean**	0.85	1.01	0.92	0.36	0.61
	SD	7.86	6.66	6.99	6.73	7.36
	CV	9.21	6.63	7.58	18.67	12.11
Canada	**Mean**	0.79	1.50	0.52	-0.23	0.41
	SD	8.62	7.13	6.55	6.56	6.44
	CV	10.97	4.75	12.56	-28.78	15.62
Denmark	**Mean**	1.25	1.22	1.05	0.35	-0.10
	SD	9.98	9.04	8.51	8.88	7.83
	CV	7.95	7.38	8.13	25.18	-78.94
Finland	**Mean**	0.78	1.57	2.12	0.94	1.22
	SD	15.52	14.65	16.26	14.95	14.98
	CV	19.84	9.30	7.66	15.90	12.31
France	**Mean**	0.41	1.68	1.58	-0.29	0.23
	SD	10.27	9.80	10.76	9.88	9.95
	CV	25.22	5.84	6.81	-33.77	43.59
Germany	**Mean**	1.89	1.09	2.34	-0.29	-0.76
	SD	11.10	10.45	9.82	8.25	9.89
	CV	5.89	9.55	4.19	-28.93	-13.08
Hong Kong	**Mean**	0.30	0.32	1.47	-2.37	0.99
	SD	21.13	16.94	21.32	17.55	15.68
	CV	69.83	52.53	14.49	-7.40	15.84
Italy	**Mean**	-0.25	2.21	0.05	0.86	1.26
	SD	16.10	13.43	13.48	11.96	12.43
	CV	-64.15	6.08	295.79	13.98	9.87
Japan	**Mean**	-1.61	1.17	0.49	0.00	-0.30
	SD	13.58	10.51	11.10	10.32	10.69
	CV	-8.44	8.98	22.43	-9527.62	-35.53
Netherlands	**Mean**	2.51	0.91	1.44	-0.57	0.52
	SD	10.27	9.92	9.46	8.93	9.87
	CV	4.10	10.94	6.58	-15.54	18.92
New Zealand	**Mean**	-1.25	-0.90	3.09	0.79	-0.40
	SD	10.80	13.87	13.40	10.08	10.07
	CV	-8.63	-15.39	4.33	12.69	-25.09
Norway	**Mean**	0.40	1.11	0.69	0.10	0.72
	SD	10.62	10.70	10.29	9.16	9.31
	CV	26.65	9.61	14.88	89.05	12.85
Spain	**Mean**	0.62	1.73	0.81	0.81	1.59
	SD	11.97	10.73	11.49	10.49	10.02
	CV	19.32	6.22	14.18	12.95	6.32
Sweden	**Mean**	2.22	0.78	0.93	0.68	0.71
	SD	12.03	10.97	11.28	10.33	11.11
	CV	5.43	14.04	12.19	15.28	15.61
Switzerland	**Mean**	1.07	1.36	1.58	0.13	0.79
	SD	10.03	8.67	8.96	8.80	8.43
	CV	9.38	6.39	5.66	69.66	10.67
UK	**Mean**	0.28	0.85	1.09	0.35	0.35
	SD	7.40	6.81	7.36	7.17	8.10
	CV	25.97	7.97	6.73	20.33	23.28
USA	**Mean**	0.93	1.83	0.56	-0.25	0.82
	SD	8.30	7.98	6.32	7.14	7.68
	CV	8.89	4.37	11.31	-29.01	9.35

Table 4
Daily Summary Statistics for Dollar Returns

Countries		Monday	Tuesday	Wednesday	Thursday	Friday
Australia	**Mean**	-0.33	-0.32	1.11	0.44	0.50
	SD	11.26	10.16	10.69	9.36	11.26
	CV	-33.75	-32.24	9.65	21.45	22.66
Austria	**Mean**	0.77	-0.05	0.91	-0.16	-0.19
	SD	9.83	10.04	9.13	8.76	9.81
	CV	12.82	-217.15	9.99	-56.18	-52.39
Belgium	**Mean**	0.81	0.65	0.94	0.15	0.98
	SD	9.04	7.65	7.93	7.96	8.70
	CV	11.22	11.68	8.42	54.09	8.90
Canada	**Mean**	0.50	1.38	0.8	-0.53	0.34
	SD	9.65	7.48	7.50	7.43	7.16
	CV	19.15	5.44	9.37	-13.94	21.35
Denmark	**Mean**	1.13	0.86	0.99	0.46	0.16
	SD	9.97	9.36	8.59	10.01	9.16
	CV	8.79	10.84	8.71	21.96	58.52
Finland	**Mean**	1.02	1.17	2.26	0.84	1.54
	SD	15.62	14.92	16.48	15.61	15.73
	CV	15.29	12.74	7.30	18.64	10.24
France	**Mean**	0.30	1.30	1.59	-0.27	0.48
	SD	10.57	9.11	10.29	10.00	9.22
	CV	35.45	7.01	6.47	-37.33	19.30
Germany	**Mean**	1.91	0.63	2.24	-0.27	-0.48
	SD	11.22	9.90	9.72	9.52	10.60
	CV	5.89	15.61	4.34	-35.00	-22.13
Hong Kong	**Mean**	0.34	0.32	1.48	-2.38	0.96
	SD	21.15	16.96	21.33	17.53	15.70
	CV	61.99	53.35	14.43	-7.37	16.34
Italy	**Mean**	-0.35	2.04	-0.04	1.02	1.09
	SD	17.20	14.19	14.14	13.62	13.58
	CV	-48.47	6.96	-314.60	13.37	12.41
Japan	**Mean**	-1.57	0.86	0.53	-0.32	-0.57
	SD	16.10	11.45	13.54	11.98	12.94
	CV	-10.29	13.35	25.51	-37.41	-22.57
Netherlands	**Mean**	2.51	0.40	1.35	-0.58	0.82
	SD	9.90	8.94	8.63	9.03	9.68
	CV	3.94	22.18	6.40	-15.59	11.85
New Zealand	**Mean**	-1.55	-0.79	2.88	0.68	-0.07
	SD	12.66	13.99	15.03	11.12	10.92
	CV	-8.17	-17.77	5.21	16.33	-146.68
Norway	**Mean**	0.21	0.36	0.85	0.09	1.30
	SD	11.06	10.87	10.55	9.91	9.65
	CV	52.35	29.87	12.42	106.32	7.45
Spain	**Mean**	0.65	1.49	0.59	0.70	1.57
	SD	12.26	10.79	11.66	10.77	10.24
	CV	18.78	7.25	19.79	15.30	6.51
Sweden	**Mean**	1.96	0.33	1.17	0.73	1.14
	SD	13.18	11.93	11.76	11.20	12.02
	CV	6.74	36.70	10.08	15.41	10.54
Switzerland	**Mean**	1.17	0.98	1.54	-0.01	1.19
	SD	10.31	8.31	8.53	9.54	9.31
	CV	8.80	8.47	5.55	-846.45	7.82
UK	**Mean**	0.44	0.92	0.96	0.50	0.48
	SD	8.10	7.41	7.47	7.93	7.97
	CV	18.57	8.05	7.75	15.98	16.63
USA	**Mean**	0.93	1.83	0.56	-0.25	0.82
	SD	8.30	7.98	6.32	7.14	7.68
	CV	8.89	4.37	11.31	-29.01	9.35

Note that four countries, namely Belgium, Denmark, Germany and Switzerland, have positive and significant local returns on three consecutive days, Mondays through Wednesday, and zero mean returns on Thursdays and Fridays. In addition, the USA has also positive returns on three days, although not consecutive. No other countries have more than two days with significant positive returns. The mean returns on Italy (Sweden) are not different from zero on all days except Tuesday (Monday), having a significant positive return.

In terms of dollar returns, on Wednesdays the mean returns are *significantly positive* in ten of the *twelve* countries, excluding Spain and Sweden. On Tuesdays, five countries (Canada, France, Spain, Switzerland and the UK) exhibit *significantly positive* mean returns while *insignificant negative* mean returns exist for *only* New Zealand. On Mondays, five countries (Denmark, Germany, the Netherlands, Sweden and Switzerland) exhibit *positive* and *significant* mean returns whereas *only* in New Zealand a *significantly negative* mean return is observed. On Thursdays, the mean returns are lower or negative, but not significant. On Fridays, in three countries (Belgium, Spain and Switzerland), *significantly positive* returns are observed. However, the mean returns on Fridays do not yield the highest positive returns. There is a general pattern of higher returns around the middle of the week (Wednesday and then Tuesday) in five countries, and a pattern of lower returns towards the end of the week (Thursday and then Friday) in al countries except Belgium, Spain and Switzerland, having significant positive returns on Fridays. The lower pattern is clearer than the higher one.

It should be noted that Switzerland is the only country having significantly positive dollar returns on all days except Thursday. The mean returns in Sweden (Finland) are undistinguishable from zero on all days except Monday (Wednesday), having a significant positive return. All the other countries have significantly positive returns at least on two days.

Our results show that significantly positive mean returns concentrate on Tuesdays and then on Wednesdays for local currencies. On the other hand, they concentrate on Wednesdays and then on Tuesdays for dollar returns. These findings are consistent with Balaban (1995, 1996) and Dubois and Louvet (1996) for positive Wednesday returns, but contradict Solnik and Bousquet (1990), Barone (1990), Agrawal and Tandon (1994), Balaban (1995, 1996), and Dubois and Louvet (1996) who provide evidence for negative Tuesday returns. There is a loading pattern for lower or negative mean returns on Thursdays and on Fridays, but these statistics are

not significant. These findings contradict Solnik and Bousquet (1990), Agrawal and Tandon (1994), and Balaban (1995, 1996) who report highest positive mean returns on Fridays. It should be noted that these contradictions might stem from the differences in time period covered and/or the countries analysed, or a possible shift in observed daily patterns as noted by Balaban (1995, 1996).

The standard deviations of daily returns denominated in local currency and dollars for each country by days of the week are also presented in Table 3 and Table 4 respectively. It is observed that standard deviations on Mondays are in general the highest in both local currency and dollar returns. In local currency returns, standard deviations are generally the lowest towards the end of the week (Thursday and Friday). In dollar returns, the lowest standard deviations are on the average observed on Tuesdays.

The coefficient of variation (CV), standard deviation divided by mean return, is used as a measure of risk per unit return. In local currency returns, the lowest CV values are observed on Tuesdays among days of the week whereas they concentrate on Wednesdays in dollar returns. Moreover, the highest CV values appear towards the end of the week (Thursday and Friday) in both local currency and dollar returns.

The highest standard deviations of local currency returns on Mondays conform with the previous studies: Fama (1965), Gibbons and Hess (1981), Agrawal and Tandon (1994), and Balaban (1995, 1996). The highest standard deviations of dollar returns on Mondays also agree with them. However, it is interesting to observe the lowest standard deviations of dollar returns on Tuesdays, just after Mondays with the highest standard deviations. For most of the countries, the overall standard deviations of daily mean returns have higher values in dollars than in local currency for the whole period.

As illustrated in Table 5 and Table 6, domestic and global investors can achieve the highest daily mean returns in Finland. However, it should be noted from Table 4 that positive and significant dollar returns in Finland are observed only Wednesdays. Both the domestic and global investors are exposed to the lowest risk per unit return in Switzerland where four (three) days have significantly positive mean dollar (local) returns. On the other hand, both groups of investors assume the highest risk per unit return in New Zealand among the countries which exhibit daily seasonality. For all the nineteen countries, the highest risk per unit return in local currency is observed in Japan, and in dollars in Hong Kong. This may be

attributable to the turmoil in South East Asia which might have an effect on one year data from July 1997 to July 1998.

Table 5
Summary Statistics for Local Currency Returns

Countries	Mean	Standard Deviation	Skewness	Kurtosis	CV
Australia	0.34	8.76	-0.2464	3.8958	26.09
Austria	0.30	8.58	-0.4422	5.9660	28.26
Belgium	0.75	7.13	-0.1705	1.6277	9.51
Canada	0.60	7.12	-0.8994	6.0959	11.90
Denmark	0.76	8.88	-0.0981	1.9782	11.74
Finland	1.33	15.27	-0.3751	4.6448	11.50
France	0.72	10.15	0.0292	1.6808	14.10
Germany	0.86	10.00	-0.5522	4.1059	11.68
Hong Kong	0.14	18.68	0.4295	12.0673	130.53
Italy	0.82	13.56	0.0341	1.4806	16.46
Japan	-0.05	11.32	0.3833	5.2096	-230.33
Netherlands	0.96	9.74	-0.1087	4.2270	10.15
New Zealand	0.27	11.85	-0.9277	29.6007	44.48
Norway	0.61	10.03	-0.2355	2.2898	16.55
Spain	1.11	10.96	-0.1526	1.4454	9.87
Sweden	1.06	11.16	-0.0116	2.0995	10.50
Switzerland	0.99	9.00	-0.2831	2.0831	9.13
UK	0.59	7.37	-0.1735	0.9211	12.57
USA	0.78	7.54	-0.4892	7.1037	9.67

Table 6
Summary Statistics for Dollar Returns

Countries	Mean	Standard Deviation	Skewness	Kurtosis	CV
Australia	0.28	10.57	0.0364	2.2579	37.92
Austria	0.26	9.52	-0.1774	2.0735	36.86
Belgium	0.71	8.26	-0.0307	1.1689	11.72
Canada	0.50	7.91	-0.8952	5.6557	15.93
Denmark	0.72	9.43	0.0116	1.3583	13.11
Finland	1.36	15.67	-0.2799	3.2719	11.48
France	0.68	9.86	-0.0050	1.1921	14.52
Germany	0.81	10.25	-0.3119	1.9322	12.73
Hong Kong	0.14	18.69	0.4403	12.0114	129.92
Italy	0.75	14.61	0.0962	1.7188	19.47
Japan	-0.21	13.31	0.2994	4.0074	-62.12
Netherlands	0.90	9.29	0.0727	3.2271	10.32
New Zealand	0.23	12.91	-0.6731	21.3072	55.95
Norway	0.56	10.42	-0.3159	1.9755	18.52
Spain	1.00	11.16	-0.2649	1.3874	11.14
Sweden	1.06	12.03	-0.1553	1.5446	11.32
Switzerland	0.97	9.23	-0.1584	1.2710	9.48
UK	0.66	7.77	-0.1739	0.9116	11.79
USA	0.78	7.54	-0.4892	7.1037	9.67

4. Conclusion

This study presents international evidence for the existence of the day of the week effects for a recent period of time from the perspectives of domestic and global investors. The daily effects are analyzed in stock market returns denominated in both local currency and dollars for nineteen countries. A daily pattern in stock markets is observed for fourteen countries in local currency returns and for twelve countries in dollar returns.

The observed daily patterns differ for local currency and dollar denominated returns, the latter being exhibiting lower daily means and higher standard deviations compared to the former. In local currency terms, a pattern of higher returns around the middle of the week (Tuesday and then Wednesday) and a pattern of lower returns towards the end of the week (Thursday and then Friday) are observed. In dollar terms, a higher pattern occurs around the middle of the week (Wednesday and then Tuesday) and a lower one is observed towards the end of the week (Thursday and then Friday). The lower patterns are more apparent in both cases. Standard deviations on Mondays are the highest in both local currency and dollar returns. In local currency returns, volatility is the lowest towards the end of the week (Thursday and Friday) whereas the lowest standard deviations of dollar returns are observed on Tuesdays. The lowest CV values are respectively observed on Tuesdays and Wednesdays for local and dollar returns while the highest values appear towards the end of the week (Thursday and Friday) for both local and dollar returns.

We believe that our empirical results detecting significant and different daily patterns of mean returns and their volatility in local currency and dollar terms have useful implications for international portfolio diversification.

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