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The solar and lunar divide and the impact on Taiwan's stock returns

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Abstract: Under the influence of the western world, the solar New Year celebration seems to have fascinated everyone in Taiwan with the lunar New Year festivity showing much less vigor. This paper examines the impact of the solar and lunar New Years on the stock market of Taiwan, showing that the lunar effect outshines the solar one, but the magnitude is decreasing for both as the years go by. In addition, this effect is more significant in the year of horse.

Subjects: Corporate Finance; Economics; Economics, Finance, Business & Industry

Keywords: event study; lunar/solar New Year; stock market; traditions

JEL classifications: G10; G14

1. Introduction

Traditions die hard, but new fashions emerge to win the heart of the young and the celebration for the solar New Year has been beefing up. With the fireworks and final countdown around the globe, the event is surely a spectacular one. Still, the lunar New Year has a particular meaning in Taiwan, where many festivities are still based upon the lunar calendar. One would wonder if this new trend may be as notable on the stock returns.

To be sure, if people are in the mood of celebration, the vibrant atmosphere would leave its mark on the market by investors. The stock market shows abnormally high rectums on the trading day before holidays in the US, an effect also exists in Japan and the UK (Kim & Park, 1994). Though Japan and the UK carry holidays distinct from those of the US, the holiday effects exist and are independent of the impact in the US. To be sure, what happens in the western world may also be seen in the

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ABOUT THE AUTHORS

Der-Yuan Yang is interested in exploring the relationships between traditions and the stock market coupled with other socioeconomic phenomena. One recent paper to be published in Asian Population Studies deals with the distribution of the birth signs among the population and newborns of Hong Kong, Singapore, and Taiwan.

Chen-Hsun Lee is interested in econometrics, international finance and management, with particular focus on related social phenomenon such as corporate social responsibility. One of his recent publications is "Examining the theory of capital structure: Signal factor hypothesis," published in *Applied Economics*.

PUBLIC INTEREST STATEMENT

The solar New Year celebration is one of the most visible global events and is getting much more popular in Taiwan with tens of thousands people gathering for the year- end countdown. In contrast, the party mood of the lunar New Year is much less that of the solar one, though the tradition is still treasured by all Taiwanese. The return on the stock market has been shown to rise as holidays approach, a phenomenon exists in many places. One would wonder whether the new fashion will carry more weight on the stock market when the influence of the old is visibly perceived in a country. That is the question this paper tries to answer. The result shows that the stock returns of the lunar New Year appear to be higher, though the celebration mood of the solar one seems to suggest otherwise.

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orient, perhaps with much more vitality, in particular, for the lunar New Year celebration. Yuan and Gupta (2014) indicate that there are positive returns in the pre-lunar New Year period for several Asian stock markets using data from 1999 to 2012. In contrast, Yen and Shyy (1993) observe a similar phenomenon with data from 1976 to 1990.

This paper examines whether a new trend could stand out in comparison to an old tradition on the stock market. The result shows that though the celebration of the solar New Year has been becoming much more fashionable, the traditional lunar one still carries more punch on the stock market. However, there is evidence that the impact is diminishing for both with the solar impact decreasing faster than the lunar one.

2. Data and empirical tests

The data source is Taiwan Economics Journal with the trading value and the weighted average index of Taiwan's stock market from 1971 to 2014. Taiwan used to be ruled under an authoritarian regime, in which forming political parties and organizing strikes or protests were forbidden. The martial law was finally lifted in 1987, ending the limitation on the exercise of civil rights. The 1990s witnessed the rapid transition of Taiwan's economy and in late 1989 the very first mass demonstration by the have-nots occurred, to certain extent signifying the diminishing of the "traditional values." The obedience toward the regime once taken as granted has been broken down. On the other hand, Taiwan has gathered its pace on globalization and become more integrated into the world economy. Therefore, 1990 is treated as the cutting point of the solar/lunar divide.

The performance of the stock market around the New Year's Day, both solar and lunar, is inspected here. When $T = 0$, it denotes the event day, while $\pm T$ means T transaction days after/before the event day. The event window is ±15. The returns on T are based on the changes of P, the weighted average stock index, of the two periods, calculated as follows:

$$\mathrm{AR}_T = \ln\left(P_T\right) - \ln\left(P_{T-1}\right) \tag{1}$$

To aggregate the returns over the estimation period, the cumulative abnormal returns are the summation of the respective returns of the days covered as indicated below:

$$\mathrm{CAR}_T = \sum_{T=-15}^{T} \mathrm{AR}_T \tag{2}$$

For 1972–1990, the average of the solar CAR_{15} is 5.369%, smaller than that of the lunar one, 6.035%, indicating greater lunar effect (see Table 1).

Table 2 again shows greater lunar effect. For 1972–2014, the solar CAR_{15} is 3.515% and that of the lunar 4.955%. The effect is smaller than the previous period 1972–1990, indicating a declining New Year effect for both with the solar impact decreasing more than the lunar one. To be more exact, the decrease in the return for the New Year effect is 62% for the solar and 31% for the lunar. In other words, the lunar New Year impact outshines the solar one at a larger scale, even though, as stated before, the celebration of the solar New Year actually has been carrying much more fanfare.

In addition to stock returns, trading value may be an important factor to consider for their relations across time and a different approach is needed. To capture the co-movement of various variables across time, Rua and Nunes (2009) and Rua (2010) propose wavelet analysis, which uses wavelet coherency to measure the localized correlation between $x(t)$ and $y(t)$ in the time–frequency space, where x and y are the variables concerned and t refers to the time. Complex wavelet coherency $\rho_{xy}(\tau, s)$ is defined as follows:

$$\rho_{xy}(\tau, s) = \frac{\Re(W_{xy}(\tau, s))}{\sqrt{|\, W_x(\tau, s)\,|^2 |\, W_y(\tau, s)\,|^2}} \tag{3}$$

Table 1. Solar/lunar CAR (1972–1990)

Date	Solar CAR				Lunar CAR			
	−15	−1	+1	+15	−15	−1	+1	+15
1972 rat	0.008	6.892	6.663	1.815	0.229	2.276	1.015	5.098
1973 ox	1.796	11.617	13.623	16.996	1.018	6.638	8.062	10.629
1974 tiger	0.892	−2.259	−1.700	−2.558	−0.012	0.210	−0.311	−8.397
1975 rabbit	−1.651	−10.778	−11.955	1.624	2.543	19.351	20.658	19.105
1976 dragon	−2.013	9.692	12.291	21.295	3.640	9.109	6.113	6.429
1977 snake	1.669	16.353	20.886	17.579	−0.263	−5.539	−9.166	−17.539
1978 horse	−0.976	6.709	6.150	9.710	−3.075	−0.116	0.173	−1.748
1979 goat	1.224	−11.411	−11.771	−16.347	−1.262	−3.511	−2.215	−5.389
1980 monkey	− 0.241	5.466	7.822	4.766	0.228	0.873	0.294	5.433
1981 rooster	− 0.929	−1.131	−1.922	−0.679	0.360	3.776	4.016	8.851
1982 dog	0.108	2.141	1.262	0.849	−0.879	−1.291	−2.265	−4.592
1983 boar	−0.156	0.038	−0.036	1.772	−0.231	3.642	4.478	16.164
1984 rat	−0.640	5.662	0.338	9.574	0.498	5.146	6.180	11.204
1985 ox	−0.308	−1.647	−2.627	−3.071	0.067	0.849	−1.096	1.952
1986 tiger	0.251	3.189	3.739	4.098	0.154	5.487	6.647	11.463
1987 rabbit	0.228	4.292	6.577	12.847	0.808	6.691	8.961	12.280
1988 dragon	−2.290	−19.079	−19.027	−4.610	0.691	14.779	15.295	13.867
1989 snake	−3.915	−20.082	−25.005	−7.274	−2.347	2.816	6.565	12.712
1990 horse	−2.799	13.507	15.859	33.629	0.094	19.269	20.163	16.833
Average	−0.513	1.009	1.114	5.369	0.090	4.698	4.908	6.035

where $W_{xy}(\tau, s) = W_x(\tau, s)\bar{W}_y(\tau, s)$ is the cross-wavelet transform, $W_x(\tau, s)$, the continuous wavelet transform of the time series $x(t)$, $\Re$, the real part of the cross-wavelet spectrum measuring the contemporaneous covariance, and the time shift parameter τ and scale parameter s are used for the translation and scaling of the wavelets, respectively. Complex wavelet coherency (ρ_{xy}) measures the correlation of each time point in two time series under different frequencies.

Here, the two variables of interests are stock returns and trading value. Using wavelet analysis and causality tests, we examined the influence of the new years in the solar and lunar calendars on trading volume and whether these New Year effects are the result of intentional boosts by investors or particular seasonal effects. CAR_{+15} is the proxy of stock returns and that of trading value is WV/YV ratio defined in Equation (4). V_i is the daily trading value of the stock market on day i. The first term on the right-hand side of Equation (4) is the average daily trading value of the event window, the second term the average daily trading value of the year, and n is the number of trading days in a year.

$$\text{WV/YV ratio} = \left(\sum_{i=-15}^{15} V_i/30\right)/\left(\sum_{k=1}^{n} V_i/n\right) \tag{4}$$

According to the wavelet analysis, the darker the color, the more significant the co-movement (see Figures 1 and 2). The solar New Year shows temporary co-movement in 1990 and 2000, meaning that the higher the trading value, the higher the returns on the stock market. In contrast, such an effect is not significant in the lunar New Year, showing that the lunar New Year carries a distinct impact on the mind of the Taiwanese investors; disregard of the trading value, the returns on the stock market moves forward.

Table 2. Solar/lunar CAR (1991–2014)

Date	Solar CAR				Lunar CAR			
	−15	−1	+1	+15	−15	−1	+1	+15
1991 goat	−2.687	−2.513	−8.687	−15.954	6.505	16.968	21.040	15.792
1992 monkey	−0.405	2.796	3.063	13.791	0.867	9.471	6.568	3.325
1993 rooster	0.412	−10.768	−11.806	−13.289	−3.784	−1.029	−5.133	8.834
1994 dog	3.452	20.815	26.363	18.723	0.575	6.867	2.335	−7.913
1995 boar	−0.234	6.182	5.150	−4.046	−1.647	−8.524	−8.199	−3.497
1996 rat	1.175	4.231	3.695	1.558	2.348	2.457	3.614	0.407
1997 ox	−0.008	1.575	−0.077	6.046	−0.459	1.930	2.792	8.325
1998 tiger	−0.650	−2.545	−2.889	−3.633	−1.612	−0.907	2.970	9.570
1999 rabbit	−1.556	−9.365	−13.598	−12.362	−3.193	−7.169	−2.547	4.053
2000 dragon	−0.928	7.849	11.427	16.973	−0.926	7.906	9.441	3.546
2001 snake	1.794	−10.892	−6.835	9.180	−1.115	19.806	16.894	23.132
2002 horse	−0.893	4.231	5.106	8.685	0.233	7.674	8.389	12.132
2003 goat	−1.176	−6.574	−4.961	4.889	2.849	6.469	2.782	−5.337
2004 monkey	1.091	1.493	4.022	9.400	0.060	6.867	8.683	11.475
2005 rooster	−0.555	3.785	3.841	−1.066	0.606	3.039	4.320	6.076
2006 dog	0.031	4.434	−3.107	3.487	1.402	−1.282	−0.331	−2.166
2007 boar	−0.317	2.425	3.658	2.664	−0.148	−1.602	−0.446	−2.756
2008 rat	0.468	−1.073	−3.251	−12.576	1.779	−4.526	−6.111	5.344
2009 ox	−0.071	−1.463	0.843	−9.234	2.306	−7.770	−7.488	−3.418
2010 tiger	1.514	6.434	6.674	3.197	−2.499	−8.818	−7.242	−4.782
2011 rabbit	0.204	2.868	3.455	2.666	0.400	4.046	3.675	−0.630
2012 dragon	0.805	2.561	0.851	8.663	0.257	2.478	4.851	10.905
2013 snake	0.055	1.176	2.206	1.947	−1.094	2.643	3.108	4.006
2014 horse	−0.114	1.972	1.984	9.406	0.145	−0.441	−2.810	0.885
Average	0.059	1.235	1.389	2.046	0.157	2.487	2.680	4.165
1972–2014 average	−0.194	1.135	1.268	3.515	0.128	3.421	3.621	4.955

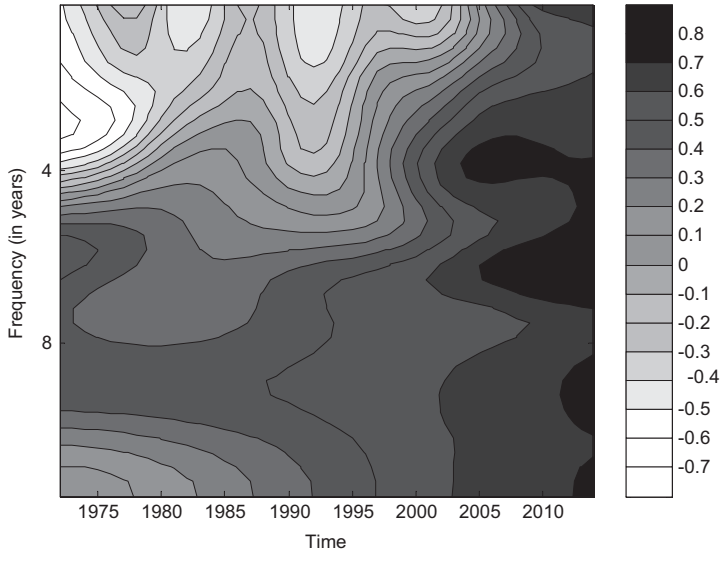

Figure 1. Co-movement of trading value and stock returns, the lunar case.

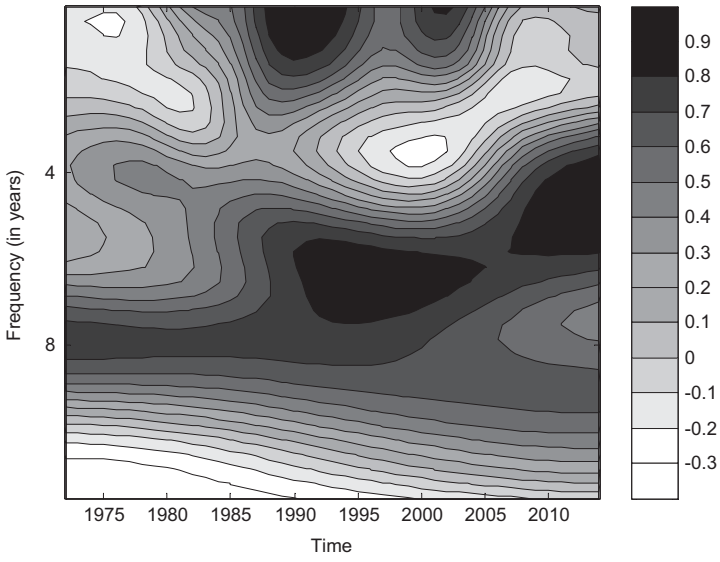

Figure 2. Co-movement of trading value and stock returns, the solar case.

After discussing the relationship between trading value and stock returns, now we inspect the relationship between the solar/lunar New Year effect. Figure 3 shows the solar/lunar CAR_{+15}, but there seems to be no clear connection between the two. Further tests are needed.

To examine the short run relationship between the solar/lunar New Year effect, Granger causality analysis is applied and the Granger causality test is as follows (Granger, 1969):

$$\Delta \text{Lunar}_t = \alpha_0^{(1)} + \sum_{j=1}^{k_1} \beta_{1j}^{(1)} \Delta \text{Lunar}_{t-j} + \sum_{j=1}^{k_2} \alpha_{1j}^{(1)} \Delta \text{Solar}_{t-j} + u_{1t} \tag{5}$$

$H_0: \alpha_{1j}^{(1)} = 0$, Solar does not cause Lunar.

$$\Delta \text{Solar}_t = \beta_0^{(1)} + \sum_{j=1}^{k_3} \beta_{2j}^{(1)} \Delta \text{Lunar}_{t-j} + \sum_{j=1}^{k_4} \alpha_{2j}^{(1)} \Delta \text{Solar}_{t-j} + v_{1t} \tag{6}$$

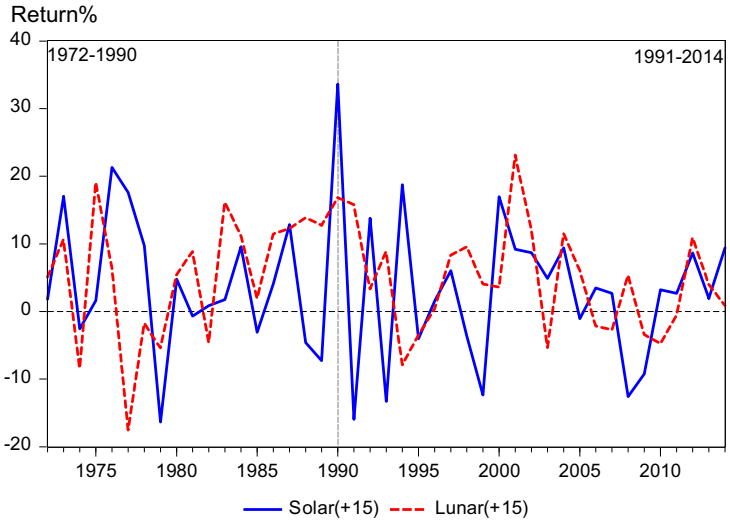

Figure 3. The solar/lunar CAR_{+15} for 1972–2014.

$H_0: \beta_{2j}^{(1)} = 0$, Lunar does not cause Solar.

where Δ denotes the difference operator.

Table 3 shows that linear causal relationship does not exist between the solar/lunar New Year effect. The solar New Year effect may come from the globalization trend, while that of the lunar one is idiosyncratic to Taiwan. Thus, there may be no clear-cut relationship between the two.

The nonlinear Granger causality of Hristu-Varsakelis and Kyrtsou (2008) is applied to further explore the relations between the two effects, dividing nonlinear causality into three types: Negative independent variables influencing positive dependent variables, positive independent variables influencing negative dependent variables, and positive independent variables influencing positive dependent variables. Table 4 shows that the negative returns of the solar New Year effect have an impact of the lunar New Year effect, indicating that the downturn of the global market will incur nonlinear Granger causality. No doubt, the stock market of Taiwan is small and vulnerable to the impact of the international markets. On the other hand, since the solar New Year always comes before the lunar one, there is a chance for certain adverse events during the solar New Year to have a negative impact on the market performance as the lunar New Year comes.

Now, the relation of the birth sign with respect to the returns of the stock market is inspected. Figure 4 shows the $CARs_{15}$ of the 12 birth signs and the ranking of the returns: the highest return occurs in the year of horse, second rabbit, and third dragon. Dragon is the most cherished birth sign in Taiwan, but the returns in the year of dragon may not be as distinguished. Taiwanese believe the birth sign dog would bring wealth to people, but the CAR_{15} of the year of dog ranks bottom instead. Tiger is regarded as a symbol of vitality and countries with strong economic performance are often called tigers such as Asian Tigers, but the stock returns are not that good in the year of tiger. The birth signs seem to be of little concerns to the investors of Taiwan's stock market.

Table 3. The linear short-run Granger causal relationship for the $CARs_{15}$ of solar/lunar New Year (1991–2014)

Null hypothesis	*F*-statistic	Prob.
Lunar15 does not Granger cause solar15	1.019	0.371
Solar15 does not Granger cause lunar15	0.403	0.671

Table 4. The nonlinear Granger causality of Hristu-Varsakelis and Kyrtsou (2008) with respect to the solar New Year impacting the lunar New Year

	Solar doesn't cause lunar		Lunar doesn't cause solar	
	F statistics	*P* value	*F* statistics	*P* value
$-R_{solar}, R_{Lunar}$	4.766	0.035	5.985	0.019
$R_{solar}, -R_{Lunar}$	0.367	0.549	2.405	0.129
R_{solar}, R_{Lunar}	0.340	0.563	1.307	0.260

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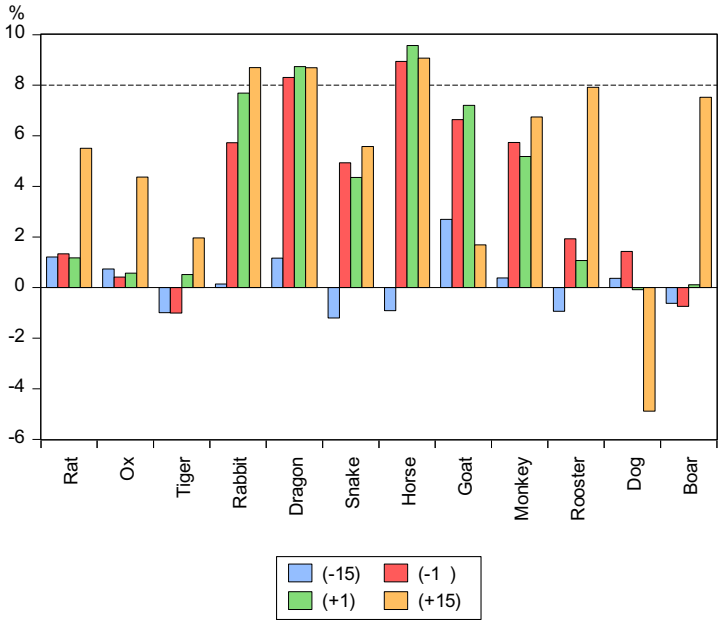

Figure 4. Various CARs for the 12 birth signs 1972–2014.

3. Discussion

To be sure, the lunar cycles have a strong impact on the stock market (Dichev & Janes, 2003). Furthermore, monthly effect does exist. The January effect, defying numerous attempts to explicate, has been shown to persist in many markets and for a long time (Haug & Hirschey, 2006). Ariel (1990) and Lakonishok and Smidt (1988) have reached similar conclusions on the stock returns around holidays in the US. In contrast, the western myth of Friday, the thirteenth may not be as menacing as it used to be and the impact on the stock market is minimal (Chamberlain, Cheung, & Kwan, 1991). However, in the orient, the traditions play a stronger role than in the west in many aspects (Ng, Chong, & Du, 2010). Overall, the evidence indicates that there are anomalies on the stock market in Taiwan even with the impact of globalization.

Indeed, many aspects of life in Taiwan have changed through the vicissitude of time, but the traditions are still there. Some new fashions have emerged to supersede the old ones. Smart phones and numerous new apps have occupied the minds of Taiwanese more than the traditions. Nonetheless, Taiwan continues to provide various cultural events that attract tourists worldwide and its economic potentials fascinate investors even more. All of the above occur when Taiwanese and its financial markets are transforming themselves into modern regimes, politically and economically. Old traditions never die; they just fade away. Some of the traditions are still deeply embedded in the mind of the people and strikingly some of them may serve as financial guidance on the stock market, though the returns are diminishing.

4. Concluding remark

This paper has explored the relationships of two festivities with respect to the performance of the stock market. Lunar New Year is the very tradition of the Taiwanese people, while the celebration of the solar one has been gathering pace. To be sure, some old traditions may have been embedded in the mind of people longer than expected. The evidence shows that the lunar New Year tradition is still there and it may even carry heavy weight on the stock market, surpassing the impact of the burgeoning global trend of the solar New Year. On the birth sign tradition and the stock returns, the year of horse is more promising than the years of dragon or dog. The result could have some implications to investors entering the emerging markets, where traditions continue to thrive. In spite of the growing new fashions, some traditions may serve as valuable financial guidelines.

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