Lunar seasonality in precious metal returns?

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Lunar seasonality in precious metal returns?

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We demonstrate for the first time the existence of a lunar cycle on precious metal returns. This appears to be more pronounced in silver than gold, with very little evidence for an effect in platinum.

I. Introduction

Much research has been devoted to the issue of how, and indeed if, phases of the moon affect human activity. Articles have analysed such diverse issues as the linkage between lunar cycles and admissions to psychiatric hospitals (Campbell and Beets, 1978), medical consultations (Neal and Colledge, 2000), criminality (Tasso and Miller, 1976; Lieber, 1978), psychiatric disturbances (Hicks-Caskey and Potter, 1991) and absenteeism (Sands and Miller, 1991). The broad consensus of research across a variety of fields is that actions associated with mood show slight but measurable variation across phases of the moon.

A further body of research has shown that investors moods, whether they are aware of these or not, can influence their economic actions. A detailed study in the work of Lucey and Dowling (2005) notes a comprehensive set of findings based on the works of Slovic, Loewenstein and others (Slovic 1987; Loewenstein et al., 1999; Loewenstein, 2000; MacGregor et al., 2000; Loewenstein et al., 2001) which provide a linkage between emotion (or mood) and economic outcomes. The key element of this line of research is that investors may not be aware of the effect that mood has on their decision making; even if they are aware it is extraordinarily difficult to adjust decision making effected by mood.

In finance research, there is a growing body of literature that indicates the role of external mood-setting events on asset pricing. Research has indicated the importance of weather, in particular, sunshine (Hirshleifer and Shumway, 2003), the Seasonal Affective Disorder (SAD) phenomena (Kamstra et al., 2003), temporal adjustment because of daylight savings (Kamstra et al., 2000) and a wide variety of other weather and geophysical phenomena (Saunders, 1993; Chang et al., 2008) on cloud cover, on local weather phenomena (Loughran and Schultz, 2004), on temperature (Cao and Wei, 2005), on rain and other measures (Keef and Roush, 2005) and on geomagnetic storms and temperature (Dowling and Lucey, 2008). Remarkably little countervailing research has been published, with the exception of the work of Jacobsen and Marquering (2008).

Research has also noted the effect of sporting events as mood-setting phenomena (Boyle and Walter, 2003; Edmans et al., 2007).

More recently, there has emerged a body of work on the putative role of lunar cycles on asset prices. Drawing on the literature cited above, this article finds again slight but measurable variation in asset returns around lunar events. Yuan et al. (2006) noted that this line of research goes back at least to Rotton and Kelly (1985). Yuan et al. (2006), along with Dichev and Janes (2003) found results consistent with Hirshleifer and Shumway (2003)’s assertion that good mood leads to good (positive) returns. In the present context this has the implication that asset returns should peak at the new moon and reach a trough at the full moon. They found evidence that this was so in the work of Dichev and Janes (2003) in the USA and in the work of Yuan et al. (2006) in over 48 countries. The mechanism for such an effect is the demonstrated linkage between the lunar cycle and deep physiological rhythms (the circatrigintan rhythm; see, e.g. De
Finally, we note the existence of research that suggests that precious metals, gold in particular, are subject to significant psychological and mood influences. Aggarwal and Lucey (2007) showed evidence of significant anchoring and ‘magic number’ phenomena in gold returns, Cavaletti et al. (2004) discussed the importance of psychological issues in gold pricing and trading. In addition, precious metals have been shown (Davidson et al., 2003; Daly, 2005; Baur and Lucey, 2006; Hillier et al., 2006) to be a valuable addition to (mainly equity) portfolios. All these factors suggest that it is opportune and important to undertake an examination of the role, if any, that lunar cycles play in these assets.

II. Data

We analyse PM fixing prices in London for bullion gold, silver and platinum, all of which are quoted in US$ terms, for the period January 1998 to mid-September 2007. In total, this gives us 2530 daily observations, which we convert to returns for analysis purposes. Data on lunar phases were collected from the website of the Munich Astronomical Archive (www.maa.mhn.de/home.html). Table 1 shows the basic descriptive statistics of the data. From the lunar data we created two dummy variable series, each taking the value of 1 for the 7 days preceding, including after a full or a new moon. We call these as fullperiod and newperiod. Following Yuan et al. (2006) and Dowling and Lucey (2008), we also created a sinusoidal variable defined as $(\text{Cos}(2\pi D^t))/29.53$, where $D^t$ being the number of days elapsed since the previous full moon captures the continuous nature of lunar effects versus the discrete effects of the fullperiod and newperiod variables.

III. Analyses

We conducted a number of analyses, designed to examine the existence of a lunar effect, whether this might be cyclical, the extent to which this effect if any manifests itself in variance, and whether any findings are dependent on parametric assumptions of these tests.

We test means and variances across the new and full moon periods, the existence or otherwise of cyclicality in the returns attributable to lunar cyclicity, and whether any observed cyclicality is a manifestation of purported monthly or daily seasonality in returns. Table 2 shows descriptive statistics when we split the returns into those that occur in the newmoon and fullmoon periods defined above. There is clear evidence that significant differences in returns exist as between both full and new moon periods and between these periods and the overall returns. For gold, returns around the full moon are no less than five times smaller than the returns around the new moon. This decline is seen also in silver and in platinum; platinum returns being three times greater in new moon periods when compared with full moon periods and silver four times; silver returns in new moon periods being positive while those in full moon periods being negative. Full moons are bad news, it appears, for precious metal returns. We note, however, that statistically we cannot reject the null that the two periods returns are equal for any of the metals investigated, which is interesting given the differential between them.

We further investigate the cyclicality of returns by means of a regression of the returns on the sinusoidal variable. These results, in Table 3, indicate clearly that for the case of silver at least there appears to be evidence of lunar seasonality. This is consistent with the results found in the works of Dichev and Janes (2003) and Yuan et al. (2006). However, there is no evidence of such seasonality for gold or for platinum.

IV. Conclusion

We demonstrate for the first time the existence of a lunar cycle on precious metal returns. This appears to be more pronounced in silver than gold, with very little evidence for an effect in platinum. Despite significant apparent differences in the mean returns across the lunar cycle, we do not seem to see a strong cycle in evidence. Perhaps these markets are more efficient than might have been considered a priori.

<table>
<thead>
<tr>
<th>Table 1. Descriptive statistics</th>
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</thead>
<tbody>
<tr>
<td>Gold</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Max.</td>
</tr>
<tr>
<td>Min.</td>
</tr>
<tr>
<td>SD</td>
</tr>
<tr>
<td>Skewness</td>
</tr>
<tr>
<td>Kurtosis</td>
</tr>
<tr>
<td>Jarque–Bera</td>
</tr>
<tr>
<td>Probability</td>
</tr>
</tbody>
</table>

Notes: The four moments and other descriptive statistics of the daily returns *100 to the three precious metals, as well as a J–B test for normality are shown.
Table 2. Full versus new moon returns

<table>
<thead>
<tr>
<th></th>
<th>Gold</th>
<th></th>
<th>Silver</th>
<th></th>
<th>Platinum</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
<td>Full moon</td>
<td>New moon</td>
<td>Overall</td>
<td>Full moon</td>
<td>New moon</td>
</tr>
<tr>
<td>Mean</td>
<td>0.035371</td>
<td>0.004727</td>
<td>0.025240</td>
<td>0.029325</td>
<td>-0.004537</td>
<td>0.021045</td>
</tr>
<tr>
<td>Median</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Max.</td>
<td>7.005954</td>
<td>7.005954</td>
<td>6.471021</td>
<td>10.320766</td>
<td>9.907613</td>
<td>10.320766</td>
</tr>
<tr>
<td>SD</td>
<td>0.009588</td>
<td>0.006644</td>
<td>0.006953</td>
<td>0.017166</td>
<td>0.012101</td>
<td>0.012289</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.174343</td>
<td>-0.291415</td>
<td>0.810279</td>
<td>-0.753348</td>
<td>-0.827765</td>
<td>-1.046522</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>8.970131</td>
<td>17.621363</td>
<td>17.776521</td>
<td>11.047464</td>
<td>18.647688</td>
<td>25.694403</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.047464</td>
<td>17.776521</td>
<td>11.047464</td>
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</tbody>
</table>

Notes: The four moments and other descriptive statistics of the daily returns *100 to the three precious metals split according to whether the returns occur in the newperiod or fullperiod defined as the 7 days before and after a new or full moon event are shown. T-test is a standard t-test for equality of means as between these two periods, while S–W t-test is a t-test incorporating a Satterthwaite–Welch correction for unequal sample size and variances. Levene test is a test or equality of variance. In all cases the p-value is of a H0 that the mean (variance) are equal across the two samples.

Table 3. Lunar seasonality

<table>
<thead>
<tr>
<th></th>
<th>Constant</th>
<th>p-value</th>
<th>Cosine coeff.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold return</td>
<td>0.29</td>
<td>0.30</td>
<td>-0.29</td>
<td>0.29</td>
</tr>
<tr>
<td>Silver return</td>
<td>1.26</td>
<td>0.01</td>
<td>-1.26</td>
<td>0.01</td>
</tr>
<tr>
<td>Platinum return</td>
<td>-0.05</td>
<td>0.89</td>
<td>0.05</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Notes: The results of a regression
\[ R_t = \alpha + \beta \left( \frac{\cos(2\pi D_t)}{29.53} \right) + \epsilon \]
are shown.

References


