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Seasonal affective disorder and seasoned art auction prices: New evidence from old masters

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ABSTRACT

Psychological evidence predicts that environmental conditions such as seasons and weather are associated with mood and the finance literature has documented links between them and daily stock market returns. In this paper we examine how these conditions affect art auction prices in England during 1756–1909. We find that the amount of daylight on the auction day has a significant positive effect on selling prices in all our model specifications. In addition, we find in some specifications direct positive effects stemming from the hours of sunshine during the day, precipitation, temperatures, and whether daylight hours are getting longer or shorter.

1. Introduction

Dopt environmental conditions, such as seasons and weather, affect consumer behavior? While psychological evidence suggests so, economists assume that rational decision makers' preferences are invariant to such factors. Given the same set of economic parameters, economic agents should behave similarly when they engage in economic activity, regardless of their feelings. In contrast, the finance literature has documented links between environmental conditions and daily stock market returns.

In this paper we examine the effect of different environmental conditions on art auction selling prices. If decision makers are affected by their moods and feelings, and if the moods and feelings are affected by environmental conditions, then we expect to find an impact on auction selling prices. Our sample includes art prices at auctions conducted in England between 1756 and 1909, mainly by Christie's.

Wept use several characteristics that could influence decision makers' actions. These include daylight duration, an indicator variable equal to one if the daylight duration increases relative to the previous day, the amount of daily precipitation, daily temperature, and daily hours of sunshine. These attributes are found to influence mood in the literature on chronobiology, which is the study of rhythmicity and biological clocks which are possessed by animals and humans. One avenue posited for these effects is that these attributes affect hormone secretions that influence mood and therefore, decision making. Hence, different conditions could result in different economic decision making patterns as well.

In brief, our results show an impact on auction selling prices as follows. (i) The length of the day (elapsed time from sunrise to sunset for the given day) on which the auction is conducted is the most robust variable affecting selling price. In all our specifications we found a strong relationship showing that selling price is positively related to day length. (ii) An indicator variable capturing whether the day length increases relative to the previous day (December 21 to June 21), has a positive effect in all specifications but one, though it is not always statistically significant. (iii) We find statistically significant positive effects of hours of bright sunshine, precipitation, and

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temperature on auction selling prices. These effects diminish when we control for the day length, probably in part due to the correlation between these variables.

As usual, one needs to be careful when interpreting the regression results. Our results demonstrate strong correlations between some of the studied variables and the auction selling prices. However, we use observational data and we do not control for all possible covariates, and we do not test for causality, so we cannot be sure about the causal links. While the results suggest a real relation between the studied factors and auction selling prices, it would be useful to verify the observed effects using controlled experiments and with additional empirical investigation.

The paper is organized as follows. The next section surveys the literature regarding the effects of seasons and weather on mood and on decision making and raises the testable hypotheses. Section 3 describes the data. Section 4 performs the empirical analysis of the relations between our measures and auction selling prices. A final section offers concluding remarks.

2. Literature survey and testable hypotheses

It is well established that biological clocks control circannual rhythms (i.e., annually recurring cycles) such as seasonal changes in body mass, hibernation, and reproductive competence, via the endocrine system (Reiter (1993); Nelson (2005)). Rhythmic behavior has been detected in various aspects of conduct, such as learning, perception, memory functioning, and social behavior, even up to extreme actions such as suicide. We hypothesize, therefore, that changes in hormone secretions significantly affect mood and, therefore, decision making in economic decision making situations as well.

Our data analysis relies on the medical phenomenon known as Seasonal Affective Disorder (SAD), a form of seasonal depression caused by a biochemical imbalance in the hypothalamus due to the shortening of daylight hours and the lack of sunlight (e.g., Rosenthal et al. (1984)). A less incapacitating level of this imbalance is referred to as the “subsyndromal SAD” or "winter blues". The phenomenon is especially noticeable in geographical areas located relatively closer to the poles, where daylight duration changes are more extreme than around the equator (cf. Molin et al., 1996 and Young et al., 1997).[2] Clinically, SAD is a depressive disorder experienced in the late fall and early winter months, documented by a series of clinical and psychological studies (e.g., Rosen et al., 1990; Oren and Rosenthal, 1992; Dam, Jakobsen and Mellerap, 1998; Saeed and Bruce, 1998; Keller et al., 2005). Common SAD symptoms comprise insomnia, apathy, drowsiness, fatigue, tiredness, and focusing difficulties. As much as 5% of the population exhibit some seasonal depression, up to 20% are affected by subsyndromal features, and roughly half of the remaining population has some mild symptoms.

Weather related mood effects were explored in several economics and finance studies (cf. Hirshleifer (2001) for a review). Saunders (1993) claims that cloudy days create bad mood effects and decrease stock returns; Hirshleifer and Shumway (2003) document the effect of weather on stock prices; Howarth & Hoffman (1984), and Schwarz & Clore (1983) show that weather conditions affect mood and behavior; Keller et al. (2005) raise the possibility of limited weather effects on mood which take place in spring subject to spending considerable time outdoors.

SAD effects on stock prices have been empirically found in several studies. Garrett, Kamstra and Kramer, 2005 detect seasonal patterns in stock returns and argue that SAD affects markets through mood impacts on risk aversion; Kliger and Levy (2003) show that investors' risk preferences are affected by seasonal mood; Garrett et al. (2005) corroborate a SAD effect using a conditional CAPM allowing seasonal changes in the price of risk; Dowling and Lucey (2008) investigate the effects of several mood proxies constructed from weather and biorhythm data on returns in a large and globally diverse equity dataset, concluding that SAD and low temperature show the greatest relations with equity prices; Kaplanski and Levy (2008) employing the Volatility Index (VIX) calculated by the Chicago Board of Options Exchange, find that SAD factors increase contemporaneous VIX levels, though the increase is not validated by corresponding levels of the subsequently realized stock market volatility; Kliger, Gurevich and Haim (2012) document seasonal effects on initial public offerings short- and long-run performance; and Kliger and Kudryavtsev (2013) find seasonal differences in stock price reactions to analyst recommendations.

Kliger and Levy (2008) integrate considerations of mood into non-expected utility theories to find that seasonal mood distorts investors' probability perceptions. An important element in many non-expected utility theories is the Probability Weighting Functions (PWF) that nonlinearly weight physical probabilities. Using US market price data, they establish an empirical relation between SAD and the shape of the PWFs, pointing out that bad moods cause investors to systematically distort their PWFs.

In light of the picture emerging from the literature, we posit the following testable hypotheses and their alternatives. First, we hypothesize on the role of daylight on mood and, therefore, on auction pricing:

H1,0. auction prices are not correlated with daylight length and changes;

H1,1. auction prices are correlated with daylight length or changes.

The idea is that bidders' moods respond to two daylight exposure properties. The first is the gradient (i.e., change) of daylight exposure, and the second is its level (Nelson, 2005). Humans' sensitivities to changes, as opposed to levels, of stimuli is a common behavioral feature of the perceptual apparatus (cf., e.g., Kahneman and Tversky (1979), p. 277). Thus: (i) decreasing daylight duration proxies declining or poorer mood, and increasing duration proxies improving or better mood; and (ii) daylight duration is positively correlated with mood, though maybe to a lesser extent than the gradient proxy.

In addition to hypothesizing on daylight effects, we explore weather attributes which have been shown to affect mood. High temperature, precipitation, and high levels of sunshine hours were all found to be positively correlated with good mood (Goldstein, 1972; Cunningham, 1979; Howarth & Hoffman, 1984).[3] Given the above background, we hypothesize the following:

H2,0. auction prices are not correlated with any weather attributes;

H2,1. auction prices are correlated with at least some of the weather attributes detailed above.

3. Data description

3.1. Art auction data

This study analyzes a dataset created from several sources. This subsection describes the art auction data, while the next subsection describes the weather and daylight data. The art auction data are drawn from a database constructed by Bayer and Page (2011), based on the work of Graves (1970) and Redford (1888).[4] This includes

[2] Note that SAD may be asymmetric around winter solstice (see Palinkas, Houseal and Rosenthal, 1996 and Palinkas and Houseal 2000).

[3] Note, however, that high temperature has also been associated with poor mood (Goldstein, 1972) and violent behavior (Anderson, 2001). In addition, Schwartz & Clore (1983) reported that their subjects exhibited decreased life satisfaction on rainy days. In contrast, we report positive effects to both precipitation and temperatures.

[4] This description of the data draws heavily on Bayer and Page (2011).